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KEY TO PRONUNCIATION.

ä	far, father
ā	fate, hate
a or ă	at, fat
ã	air, care
ạ	ado, sofa
â	all, fall
ch	choose, church
ē	eel, we
e or ĕ	bed, end
ė	her, over: also Fr. *e*, as in *de; eu*, as in *neuf;* and *oeu*, as in *boeuf, coeur;* Ger. *ö* (or *oe*), as in *ökonomie*.
ȩ	befall, elope
ẽ	agent, trident
ff	off, trough
g	gas, get
gw	anguish, guava
h	hat, hot
h or ʜ	Ger. *ch*, as in *nicht, wacht*
hw	what
ī	file, ice
i or ĭ	him, it
î	between e and i, mostly in Oriental final syllables, as, Ferid-ud-din
j	gem, genius
kw	quaint, quite
ṅ	Fr. nasal *m* or *n*, as in *embonpoint, Jean, temps*
ñ	Span. *ñ*, as in *cañon* (căn′yŏn), *piñon* (pēn′yŏn)
ng	mingle, singing
nk	bank, ink
ō	no, open
o or ŏ	not, on
ô	corn, nor
ȯ	atom, symbol
ọ	book, look
oi	oil, soil; also Ger. *eu*, as in *beutel*
ö or oo	fool, rule
ou or ow	allow, bowsprit
s	satisfy, sauce
sh	show, sure
th	thick, thin
ŧh	father, thither
ū	mute, use
u or ŭ	but, us
u̇	pull, put
ü	between u and e, as in Fr. *sur*, Ger. *Müller*
v	of, very
y	(consonantal) yes, young
z	pleasant, rose
zh	azure, pleasure
′(prime), ″(secondary)	accents, to indicate syllabic stress

THE ENCYCLOPEDIA AMERICANA

B

BULGARIA, bŭl-găr'ē-a, or bool-gä'rē-a, an independent kingdom of the Balkan Peninsula (q.v.), southeastern Europe. Bulgaria is bounded on the north by the Danube and Rumania; on the east by the Black Sea; on the south by Turkey and the Ægean Sea; and on the west by Serbia and Greece. Before the Balkan Wars (q.v.) in 1912–13 the estimated area of the country was 24,380 square miles, and of South Bulgaria (formerly Eastern Rumelia) 13,700 square miles, total 38,080 square miles. According to the census of 1900 the total population was 3,744,283; in 1906, 4,028,260; in 1910, 4,337,516. By the Treaty of London (30 May 1913) Bulgaria had gained a large amount of territory from Turkey, but being discontented with her share, she turned against her former allies (29 June 1913) and was severely defeated in the second Balkan War and in consequence lost much of what she had won. Rumania intervened and acquired about 2,900 square miles of territory. Bulgaria finally secured only about 10,000 square miles from Turkey, while she lost nearly 3,000 square miles of her own territory to Rumania, with a population of about 273,000. Balkan statistics, however, should be accepted with considerable reserve, as it is rare to find any two authorities in agreement. The most recent figures obtainable give the kingdom of Bulgaria an area of 43,320 square miles, and a total population of 4,467,000, made up of Bulgarians, Turks, Rumanians, Greeks, Serbs, Gypsies, Jews, Russians, Germans and other nationalities. Before 1913 Bulgaria was divided into 12 districts, Saint Zagora, Bourgas, Vidin, Philippopolis, Varna, Rustchuk, Tirnovo, Choumen, Pleven, Sofia, Kustendil and Vratza. The capital is Sofia (q.v.), with a population of 103,000; other chief towns are Philippopolis, Varna, Rustchuk, Slivno, Shumla and Plevna.

Soil, Climate, Industry.— The surface of Old Bulgaria is a gradually sloping plain, broken by occasional mountains, which give rise to rapid tributaries of the Danube. The Balkan Mountains or Stara Planina are described under Balkan Peninsula and Balkan Mountains. There is little mining, although the mountains are rich in minerals, iron, gold, silver, manganese and copper. The soil is excellent and the slopes of the mountains are richly wooded. The climate is healthy, and the country enjoys the reputation of possessing more centenarians than any other in Europe. People stated to be 105 to 125 years of age are not uncommon, though it is not improbable that such remarkable longevity may be due rather to unreliable records and memories than to any virtues of climate. Over 70 per cent of the people are engaged in agriculture and most of them own freehold plots on which they pay a small land tax, while they enjoy free rights over communal grazing and timber lands. A considerable quantity of grain, chiefly wheat, is exported; fruit and vegetables are raised in abundance; roses are largely cultivated for the production of the attar, which is exported to the value of $1,500,000 per annum. Wine is plentiful and cheap; silkworms are bred in some regions and tobacco forms an important crop. Stone quarries and government coal mines are in operation; domestic industries are chiefly carpets, hosiery, woolen and cotton goods and ribbons. The highways are still in a backward condition; most of the traffic is carried on by the rivers, and export trade by the Black Sea ports of Vara and Bourgas; passenger and merchant steamers run between Varna and Constantinople (150 miles). Rustchuk, Vidin and Sistova are the chief Danube ports. There is a railroad system of nearly 1,500 miles in the kingdom; Sofia is connected with the general European system, and several new lines are projected or are in course of construction, one to run from the Danube to the Ægean Sea. The National Bank of Bulgaria (capital, $4,000,000) has over 60 branches; there is also a State Agricultural Bank, and a French, a German and an Austrian bank. On 1 April 1916 Bulgaria abolished the Julian calendar (old style), which is 13 days behind ours, and adopted the Gregorian calendar. Statistics of 1914 showed the Bulgarian revenue as $51,399,000; in 1915, $55,135,975; expenditure, 1914, $51,352,520; in 1915, $55,073,240; national debt, 1915, $231,496,540. Imports, 1914, $44,586,860; exports, 1914, $28,813,372.

Government.— Bulgaria is a constitutional monarchy. Legislative authority is vested in the Sobranje, a national assembly consisting of only one chamber, to which members are elected at the rate of one representative to every 20,000 of the population. The members are paid for their services; elections are held every four years unless the Sobranje is dissolved by the King before the expiration of its term. With certain exceptions, every man over 30 is eligible. For decisions concerning highly important matters of state the Sobranje is doubled by special election and resolved into a «Grand Sobranje.» The cabinet is composed of eight ministers appointed by the King; they hold the usual portfolios — premier, finance, war, etc.

Religion.— The national religion of Bulgaria is the same as that of the orthodox Greek Church, but it is independent of that body. Over 75 per cent of the population belong to that faith; the remainder are Mohammedans, Jews, Roman Catholics, Protestants and Gregorian Armenians, whose ancestors seceded from the Greek Church in the 5th century. The University of Sofia is open to women as well as men; the state subsidizes education, which is obligatory and free to those who cannot pay for it. There are also Greek, Turkish, American, Jewish, French, Armenian and German schools, and education is further promoted by free libraries, museums and technical schools.

Military Service.— Despite its small population, Bulgaria possesses a large and efficient army. It gave a good account of itself in the Serbian War of 1885, and a still better one in the Balkan Wars. Recruiting is by conscription; Moslems are exempt on payment of a tax of $100 each. Every other Bulgarian subject is liable to 26 years' service, and the army is consequently composed of many different races. Besides the pure-bred Bulgars, there are Turks, who cannot pay the tax, Pomakes (settlers and nomads), Jews («Spanioles» and Poles), Serbs, Greeks, Rumanians, Armenians, Gypsies, Circassians, and naturalized Russians, Germans and Levantines. The army actually dates from January 1878. From 1389, when the Turks defeated the Slav allies, till 1878, the Bulgarians, as Christian subjects of Turkey, had been exempt from military service. The soldiers are well-treated, though hard-worked, and very particular attention is paid to their spiritual welfare. Should a regiment contain but one Jew and one Mohammedan, a rabbi and a dervish are provided. The barracks are comfortably built and equipped with appliances calculated to promote the health of the troops. Large mirrors and framed pictures adorn the walls; drunkenness is practically unknown, and little smoking is indulged in. The Bulgarian officer takes his profession seriously, working and studying hard with dogged pertinacity and living within his income. The basis of the army's theoretical teaching and science is German; drill, ranks and names are Russian. The corps of reserve officers — about 3,000 — is composed of merchants, lawyers, teachers, etc. There is a military academy at Sofia. The war strength of the army is considerably over 300,000. A few gunboats and about a dozen small steamers make up Bulgaria's floating strength.

History.— The Bulgarians were originally a Tartar nation, which in the 4th century settled on the Volga. The ruins of their former capital may still be seen in the neighborhood of Kazan. Their kingdom, which occupied a part of the Asiatic Sarmatia of the Greeks, was called Great Bulgaria, and is now comprehended in the Russian government of Orenburg. They afterward removed to the countries between the Bog and the Danube and called their territories Second Bulgaria. The first Bulgarian kingdom south of the Danube was founded in the latter half of the 7th century, but the Bulgarians who established it were comparatively few in number, and after their adoption of Christianity in the 9th century they became completely mixed up with the Slavonic inhabitants, though the whole became known as Bulgarians. The greatest ruler of this kingdom was Symeon (888–927), who subjugated the greater part of the peninsula and raised the Archbishop of Bulgaria to a position independent of the Patriarch of Constantinople. Under the son of Symeon this empire fell to pieces. The western half broke off and formed a separate kingdom, with Ochrida in Macedonia for its capital; and the eastern portion was subdued by the Byzantine Emperor, John Zimisces, who reincorporated it with the empire. The western Bulgarian kingdom existed only till about 1018, when it also was subdued by Basil II, «the slayer of the Bulgarians.» Toward the end of the 12th century, however, the Bulgarians revolted and managed to establish a third kingdom between the Balkan range and the Danube, which, sometimes weak and sometimes powerful, continued to exist till the advent of the Turks. The last ruler of this kingdom was conquered by Bajazet I about 1390, and for nearly 500 years the Turks ruled supreme. In 1876, on account of the atrocities of the Turkish soldiers, an insurrection broke out. Russia took the part of Bulgaria against Turkey, and the war of 1877–78 followed. (See BATAK). By the first article of the Treaty of Berlin, 13 July 1878, the principality of Bulgaria was constituted, made tributary to Turkey and placed under the suzerainty of the Sultan. In 1879, Alexander of Battenberg, a German prince, was chosen sovereign of part of Bulgaria, the rest being made a separate province, called Eastern Rumelia, to prevent Bulgaria from becoming a strong state. In 1885 there was a revolution in Eastern Rumelia, which annexed itself to Bulgaria.

The annexation of Eastern Rumelia led to a quarrel with Russia; Tsar Alexander III withdrew all Russian officers who had been training the Bulgarian army and were still serving in it. King Milan of Serbia considered the moment ripe to realize the territorial aspirations of his country and declared war on Bulgaria, 14 Nov. 1885. (See SERBO-BULGARIAN WAR). After a short, sharp campaign the Serbians were defeated but saved from extinction by the intervention of Austria. Russian and Bulgarian conspirators abducted Prince Alexander and set up a government under Russian tutelage. A counter-revolution, headed by Stambuloff (q.v.), succeeded in restoring the Prince within a few days. Unfortunately Alexander made a false move when he telegraphed to the Tsar and offered to resign his crown into Russian hands. This step turned Bulgarian opinion against him; he was compelled to abdicate and leave the country on 9 Sept. 1886. For 11 months Bulgaria remained without a ruler, its affairs being managed by a regency under the leadership of Stambuloff. This statesman, an innkeeper's son, was a rude, violent man, of uncouth manners but sincere patriotism. He had been largely responsible for throwing off the Turkish yoke, and now fought strenuously to resist the aggression of Russia. The Russian candidate for the throne was rejected and Prince Valdemar of Denmark, to whom it was offered, refused the honor. Stambuloff sent a commission round the European capitals to find a prince for the vacant post. Their choice eventually fell upon Prince Ferdinand of Saxe-Coburg-Gotha, son of Prince Augustus of Saxe-Coburg-Gotha and Princess Clémentine, daughter of King Louis Philippe of France. At the time of his election (7 July 1887), Prince Ferdinand was 26 and an officer in the Austrian Hussars. The task that lay before him was difficult and the enterprise most precarious. Though he never achieved the popularity of his predecessor, the new Prince brought his undoubted ability and ambition to the regeneration of Bulgaria. Aided by Stambuloff, who, like Bismarck, was the master of his sovereign, Ferdinand produced order from chaos with an iron hand. None of the Powers would recognize him, and it took nine years before he succeeded in wearing down the antagonism of those within and without his domain. He cultivated the friendship of Turkey and Rumania and combated the Russian influence permeating Bulgaria. It would perhaps be more correct to ascribe the strong anti-Russian policy to Stambuloff rather than to the Prince; the former was the *fortiter in re* to the *suaviter in modo* of the latter. With but one passion — love of his country — Stambuloff labored ruthlessly and mercilessly for a master whom he despised, whom he would neither flatter nor betray. Stambuloff cared nothing for the man; only for the nationality he represented. With fiery, self-sacrificing energy Stambuloff developed the resources of his country — railways, financial reform, education — creating an efficient army and fostering every type of commerce and industry. During the seven years that Prince Ferdinand and his Minister «worked together» their personal relations grew from bad to worse, developing into fierce hatred. By describing his conduct in an official communication as «infamous,» Prince Ferdinand goaded Stambuloff into resignation in 1894. Stambuloff's request that he be permitted to visit a foreign health resort was refused. He made a public declaration that he would be murdered, and on 15 July 1895 his prognostication was fulfilled; he was murdered and mutilated by four men in the streets of Sofia in the presence of the police. One of his hands, which was cut off in the struggle, is said to be still preserved in his home, to be buried on the day when his murder is avenged.

From the moment of Stambuloff's resignation Prince Ferdinand took the reins into his own hands. For the next 10 years a succession of premiers wrestled with the chaotic finances of the country and the thorny question of Macedonia. Efforts were made to establish friendly relations with Russia and Austria. Prince Ferdinand's eldest son, Boris (b. 30 Jan. 1894) had been baptized a Roman Catholic, the religion of his parents; at the age of two he was rebaptized and received into the Orthodox Greek Church, the Tsar standing as his sponsor. Russia then recognized Prince Ferdinand, and the other Powers followed suit. The Minister for Public Works in Stambuloff's last cabinet (1892–94) was a Bulgarian journalist, M. Petkoff, who had previously been mayor of Sofia. He was walking with Stambuloff at the time the latter was murdered. In 1903 General Petroff became Premier, and Petkoff joined the cabinet as Minister of the Interior. On the resignation of General Petroff (5 Nov. 1906), M. Petkoff was called to the helm of Bulgarian affairs. He belonged to the party known as the Stambuloff section of the Liberals, distinguished by its irreconcilable hostility to Russian influence in the Balkans. Less than five months (11 March 1907) later, Petkoff was shot dead on the street by a dismissed employee of the Agricultural Bank. The accession of Count von Aehrenthal (q.v.) as Austrian Foreign Minister in October 1906 was destined profoundly to influence Balkan affairs, and especially those of Bulgaria. For many years Bulgaria had been begging the Powers to relieve her of the burden of the «Capitulations,» a relic of Turkish rule. According to these rules, a foreign subject could not be arrested except in the presence of a kavass, dragoman or some other consular official, or tried without similar supervision. Practically all the other Powers had signified their readiness to abolish the Capitulations if consent thereto could be obtained from every one of them. Austria-Hungary, however, had hitherto always objected to any change. Within a month of taking office, Count von Aehrenthal rendered this service to Bulgaria, which cost Austria nothing and yet laid the principality under a great obligation. By this simple stroke the dual monarchy assured to itself the warm sympathy of Bulgaria to an extent long absent from their relations. For 10 years it had been the policy of Count Goluchowsky (Aehrenthal's predecessor) to play off the Slav against the non-Slav Balkan States, e.g., Greece and Rumania against Bulgaria and Serbia, inclining toward the former and treating the latter in a magisterial manner that aroused bitter resentment. Austria's «graceful concession» paved the way for two important events profitable to both parties. Having gained the goodwill of Bulgaria, Austria was able, in 1908, to annex Bosnia-Herzegovina, despite the fierce opposition of Serbia. To Prince Ferdinand, the removal of the Capitulations was the first step toward the realization of his larger policy — complete independence from Turkish suzerainty, and a royal crown. In September 1908, Prince Ferdinand was received with royal honors at Budapest; 12 days later (5 October) Bulgarian independence was proclaimed and the Prince took the title of Tsar of Bulgaria; two days later Emperor Francis Joseph issued a proclamation that Austro-Hungarian sovereignty was extended to Bosnia and Herzegovina. The moment was well chosen; the Young Turk revolution had just achieved its object; the Committee of Union and Progress ruled in Constantinople, and there seemed every prospect of Turkey becoming a united and enlightened nation, strong to reassert her claims on Bosnia-Herzegovina and suzerainty over Bulgaria. Shadowy indeed those claims were, for public opinion in western Europe had long ceased to consider them valid. The fact that Tirnovo (Trnovo) was chosen as the scene of the proclamation of the re-establishment of the Bulgarian kingdom added to the dramatic interest of the situation, for no portion of the Bulgarian soil is so intimately associated with the most stirring events of the national history. The church of the Forty Martyrs, wherein the Prince read the proclamation, was built in 1230 by John Asen, «Tsar and Autocrat of the Bulgarians,» whose inscription on one of the pillars reads: «I smote the Greek army . . . and all lands have I conquered, from Adrianople to Durazzo, the Greek, the Albanian, and the Servian land. . . .» Here the Bulgarian Tsars were crowned and buried, and many inscriptions of those times still adorn the walls. Turkey claimed $24,000,000 as compensation; Bulgaria offered $7,600,000. An agreement was arrived at through the intermediary of Russia, who advanced most of the money; in April 1909, the Powers recognized Bulgaria as an independent, sovereign state.

The next important event in the history of Bulgaria was the formation of the Balkan League (q.v.) and the Balkan Wars in 1912 and 1913. However much Bulgaria was to blame for the second war, the Treaty of Bucharest (10 Aug. 1913), imposed upon her by Serbia, Montenegro, Rumania and Greece, was a colossal blunder on the part of those who dictated it. It left Bulgaria sullen and dissatisfied, and robbed her of the fruits of her early victories. She failed to receive any part of that district of Macedonia inhabited chiefly by Bulgars. Serbia and Greece had obtained most of the spoils, and Rumania had rectified her frontier at Bulgaria's expense. This legitimate grievance was destined to affect the course of the great European War (q.v.) that broke out a year later. The sympathies of Rumania were with the Allies, but she could not enter the war without an understanding with Bulgaria. On behalf of Greece, M. Venizelos had promised the support of his country to Great Britain and France if the necessity should arise. In a communication to King Constantine (11 Jan. 1915) he pointed out that, if Greece allowed Serbia «to be crushed to-day. . . . we should have to submit to the disturbance of the Balkan equilibrium in favor of Bulgaria, who, thus strengthened, would either now or some time hence be in a position to attack us, when we should be entirely without either a friend or an ally.» He proposed to make «adequate concessions» to Bulgaria; but he confessed, «on account of Bulgaria's greed, it is not at all certain, whatever concessions we make, that we shall be able to satisfy her . . . .» There was every indication that Bulgaria might have been won for the Allies had her price been paid, as her most distinguished generals favored a Russian alliance; but nothing was done to conciliate her. The Bulgarian Premier, M. Radoslavoff, declared in July and again in August that Bulgaria was prepared to enter the war as soon as she received the necessary guarantees. But the Russian disaster in the Carpathians and the failure of the Dardanelles campaign persuaded King Ferdinand that by joining Germany and Austria he would be on the winning side. A secret treaty was signed about 17 July 1915 between Bulgaria, Germany, Austria and Turkey. Bulgaria was promised her price, in the shape of Serbian Macedonia, with Salonica and Epirus thrown in. During September began the Austro-German advance that was to deal the final blow to Serbia. On the 21st M. Venizelos asked the Allies for 150,000 men; they were promised on the 24th, and Greece began mobilizing. Bulgaria was also mobilizing; a deputation of ex-ministers waited on the King and warned him against joining the Central Powers. Serbia proposed on the 27th to attack Bulgaria, as the presence of German and Austrian officers in Sofia looked suspicious, but Great Britain opposed the plan, apparently still harboring belief in the Bulgarian declaration of «armed neutrality.» Had the Serbians not counted till the last moment on Greece fulfilling her treaty obligations, it is probable that they would have disregarded the British advice. On the 3d of October the Russian government addressed a note to Bulgaria declaring that there was no longer any doubt «as to the object of the present military preparations,» and the Russian Minister was instructed to leave Sofia if the Bulgarian government did not «openly break with the enemies of the Slav cause and of Russia within 24 hours by sending away the officers belonging to the armies of states who are at war with the Powers of the Entente.» An unsatisfactory reply led to a rupture of diplomatic relations, and Bulgaria formally entered the conflict on 5 Oct. 1915. On the 19th an imperial manifesto issued in Petrograd stated that «the Bulgarian troops have attacked our loyal ally Serbia, already bleeding in a struggle against a stronger enemy.» See WAR, EUROPEAN.

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BULGARIAN LANGUAGE AND LITERATURE. Bulgaria and the adjacent districts of Macedonia are considered to have been the cradle of the old Slavic languages. The ancient Bulgarian language was the richest of them all, and was the scriptural language of the Greek-Slavic Church and the great medium of ecclesiastical literature in the ancient Slavic lands. The Russian language is said to have been molded by missionaries of the Greek Church sent from Bulgaria about the 11th century, while the future empire was still in a state of semi-barbarism. The Russian tongue has preserved many inflections which the Bulgarian has lost. After the overthrow of the Bulgarian kingdom at the close of the 14th century, the grammatical structure and purity of the language became impaired by mixture with the Wallachian, Albanian, Rumanian, Turco-Tartar and Greek vernaculars; and the modern Bulgarian language has only the nominative and vocative of the seven Slavic cases, all the rest being supplied by prepositions. It has an article, which is put after the word it qualifies, like that of the Albanians and Wallachians. Among ancient Bulgarian ecclesiastical literature must be mentioned the translations of the Bible by Cyril and Methodius, and the writings of John of Bulgary in the 10th century. Grammars of the Bulgarian language have been published by Neofyt in 1835 and by Christiaki in the following year. Venelin, a young Russian scholar, sent to Bulgaria by the Russian archæographical commission, published in 1837 a grammar and two volumes of a history of the Bulgarians, but died while he was engaged in preparing a third volume. A new grammar was given to the public by Bogojev in 1845 and finally, in 1849, by the Rev. E. Riggs, an American missionary stationed at Smyrna, who also sent a Bulgarian translation of Gallaudet's ‘Child's Book on the Soul’ to New York. Dictionaries of the Bulgarian language have been compiled by Neofyt Rilski, who also published a work on education, and Stojanowicz. A Bulgarian version of the New Testament was printed at Smyrna in 1840 for the British and Foreign Bible Society. The Bulgarian national songs are numerous, and are similar to those of the Serbians. Czelakowsky's collection of Slavic songs contains a number of Bulgarian songs. Bobojev has published several historical poems. Among more recent writers the poet Christo Boteff (d. 1876), who exercised a powerful influence on the national spirit, is regarded as one of the greatest poets Bulgaria has produced; while the poet-novelist Ivan Vazoff is the most popular author to-day. He is also a dramatist and was at one time a soldier and a revolutionary. His best works were written during the years of his exile in

Russia and Rumania. Many are translated into English and other languages. Ivan Vlaikoff depicts peasant life and writes psychological romances; Michailovski is a brilliant political journalist, a mystical poet and a satirist of French education; Aleko Constantinov was a lawyer, literary critic and translator of French and Russian masterpieces, and a humorist of a high order. Perhaps the greatest literary artist of all was Pencho Slaveikov, philosopher, poet and revolutionist, who died in 1912 by the hand of an assassin. Competent critics have designated him «the Bulgarian Shakespeare» on account of his beautiful language and deep insight into the mysteries of the soul. His mantle fell on the shoulders of Petko Todoroff, dramatist, poet and philosopher. Velitchkov translated from Shakespeare, Molière and Dante; he fought against the Turks in his younger days and later held a government position. Tserkovsky is to Bulgaria what Burns was to Scotland, the bard of the peasantry. Among the younger poets there are P. Yavoroff, K. Christoff, C. Boteff and A. Strashimiroff, all intensely national in the spirit of their works. Bulgaria can also boast of a number of writers in other spheres. In history, law, philosophy and economics, V. Zlatarsky, M. Daneff, the well-known statesman, S. Radeff and Stepan Bobtcheff. D. Ivanoff is the Tolstoy of the Bulgarian short story and has all the grim realism of the Russian master. In the scientific field are Ivan Georgoff, D. Michaltchieff, P. Neukoff, G. Bontcheff and Stepan Petkoff. Literary criticism has its representatives in B. Penneff, Balabanoff, Krstieff and Ivan Shishmanoff. There are several literary societies and important reviews dealing with all aspects of human culture.

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BULGARIN, bool'găr-ĭn, **Faddĕĭ Venediktovich**, Russian author: b. Minsk 1789; d. 13 Sept. 1859. He served in the Russian army, but, finding himself neglected, in 1810 joined Napoleon. In 1819 he returned to Saint Petersburg where his writings attracted notice by their intense satire and servility. In 1825 he started the *Severnaja Pchelá* (*Northern Bee*), a daily paper, which for long was alone permitted to discuss political questions. A zealous supporter of reaction and of absolutism, he enjoyed, through relations with the secret police, an unlimited power. He was a witty and versatile writer, and published travels, histories, novels and statistical works, even signing his own name to the work of N. A. Ivanoff, professor at Dorpat.

BULGARIS, bool-gä'rēs, **Demetrius**, Greek statesman: b. Hydra 1803; d. Athens, 11 Jan. 1878. While a young man he held office in his native city and took a prominent part in the Grecian war for independence. In 1831, after the downfall of Cape d'Istria, he had charge of the administration of the Department of Marine, but on the accession of King Otho he retired from office. After the revolution of 1843 he was a member of the Senate, and from 1848 to 1849 was Minister of Finance in the cabinet of Canaris. During the Crimean War he was at the head of the cabinet and as Minister of the Interior put an end to internal disorder and conciliated the Powers. In 1857 he resigned and entered the Senate as a leader of the opposition. At the outbreak of the revolution of 1862 he was made regent and chose Canaris and Rufos as his colleagues, but was deposed by the former. In 1865, 1872 and 1874–75 he was again at the head of the cabinet.

BULGARUS, Italian jurist: b. Bologna in the 11th century; d. 1166. He lived to a great age and was one of the trusted advisers of Emperor Frederick I. He was one of the famous group of writers known as the «Four Doctors» of Bologna, and his most noted work is a legal commentary, ‘De Regulis Juris.› It was edited at Bonn (1856) by F. G. C. Bechhaus.

BULGURLU, Mount, on the Asiatic side of the Bosporus, rises over Skutari to a height of 850 feet. From the summit a magnificent view may be obtained of Constantinople, the Bosporus, the Sea of Marmora, the valleys of Thrace and the valleys and mountains of central Asia Minor. Most of the ascent can be made in an hour by carriage. An imperial kiosk near the summit was built in 1660 by Muhammad IV.

BULIMIA, a disease characterized by insatiable hunger. Persons suffering from this disorder are never satisfied. When the stomach is surfeited they throw off the food they have taken, half-digested, and with violent pain. It frequently occurs in the insane, in cases of paresis, and usually appears as a concomitant of other diseases, as certain intermittent fevers and diseases of the stomach and bowels, particularly such as are produced by the tapeworm.

BULIMUS, a genus of land-snails of the family *Helicidæ,* the species of which are mainly restricted to South America, especially Peru, Ecuador and Bolivia. Some of the species are very large, as are also their eggs, those of *B. oblongus* being about the size of a sparrow's. There is an egg of another species in the British Museum which measures exactly one and three-fourths inches in length.

BULKELEY, Morgan Gardner, American politician: b. East Haddam, Conn., 26 Dec. 1837. At the age of 15 he entered a mercantile house in Brooklyn, N. Y., and in a few years became a partner in it. When the Civil War broke out he went to the front as a private in the 13th New York regiment and served during the McClellan-Peninsula campaign under General Mansfield at Suffolk, Va. In 1872 he came to Hartford, organized and became president of the United States Bank in that city, and later (1879) was elected president of the Ætna Life Insurance Company, a position he has long held. For 30 years he has been a prominent figure in local and State politics. He was four times elected mayor of Hartford (1880–88), and in 1889 was elected governor. At the State election in November 1890, the first gubernatorial election under the new secret ballot law, the Democratic ticket received a considerable plurality over the Republican, but a majority being necessary to elect, there was some doubt whether there had been a choice by the people for governor or treasurer. Accordingly the matter went before the general assembly, which met in January 1891, and in which the Republicans had a majority of four on joint ballot, the senate being Democratic. A long contest ensued between the two houses, the senate claiming the election of the recent Democratic candidates and refusing to recognize in any manner Governor Bulkeley and the other hold-over Republican officials. The matter was finally settled on 5 Jan. 1892, when the State Supreme Court, in the *quo warranto* suit brought against Governor Bulkeley by the Democratic candidate for governor, found «Morgan G. Bulkeley to be governor, both *de facto* and *de jure*,» and his right to hold over till both houses of the general assembly should unite in declaring the election of his successor was affirmed. As the two houses could not agree, the governor remained in office for another full term. In November 1892 the Democratic ticket swept the State. He was United States Senator from 1905 to 1911. Governor Bulkeley has since, as chairman of the Connecticut highway and bridge commission, interested himself earnestly in trying to procure a fine stone bridge across the Connecticut at Hartford.

BULKELEY, Peter, American colonist and clergyman: b. Bedfordshire, England, 31 Jan. 1583; d. Concord, Mass., 9 March 1659. He was educated at Cambridge, and for 21 years was rector of a Bedfordshire parish. Being removed from this by Archbishop Laud, for non-conformity, he left England and became the first minister at Concord, in the colony of Massachusetts, of which famous town he was the chief founder. He was the author of some Latin poems, which are contained in Cotton Mather's 'History of New England'; also of some English verse and of a theological treatise, 'The Gospel Covenant Opened,' published in London in 1646. He was as remarkable for his benevolence and kind dealings as for the strictness of his virtues. Consult Tyler, 'History of American Literature' (New York 1878); Mather's 'Magnalia' (London 1702), and an article, 'Life and Times of Rev. Peter Bulkeley,' in the 'New England Historical and Genealogical Register' (Vol. XXXI, Boston 1877).

BULKHEAD, the name given to a variety of forms of partition. In its nautical sense a bulkhead is a wall or partition extending across the ship for the purpose of dividing the hold into compartments, for separating classes of merchandise, for strengthening the vessel, or more especially for confining water which may leak in to the compartment in which the breach occurs. In large vessels longitudinal bulkheads are employed, as well as those running athwartships, and communications between the compartments are maintained by means of doors which can be instantly closed in case of accident and for the purpose of maintaining forced draught. One of the most important bulkheads in a ship is the one farthest forward, which is built with great strength, being designed to withstand the shock of ramming and confining the damage to a small portion of the vessel. It is hence known as the collision bulkhead. Another form of bulkhead is a strong framework used in the construction of tunnels, to prevent the irruption of water, quicksand, etc., into the workings. The term is also applied to the facing (generally of timber) that supports the sea-wall of a harbor, and somewhat illogically to the sloping flap doors often used to cover the entrance of a dwelling-house cellar. See SHIP-BUILDING.

BULKLEY, Lucius Duncan, American physician and author: b. New York, 12 Jan. 1845. He studied at Yale University and at the College of Physicians and Surgeons, and took courses in dermatology in Europe. He became attending and later consulting physician and dermatologist in various New York city hospitals. Among his works are 'Acne and Its Treatment' (1885); 'Syphilis in the Innocent' (1889); 'Manual of Diseases of the Skin' (1898); 'Eczema and Its Treatment' (1901); 'Compendium of the Diseases of the Skin' (1912); 'Diet and Hygiene and Diseases of the Skin' (1913); 'Cancer, Its Cause and Treatment' (1915).

BULL, Charles Stedman, American physician: b. New York 1846; d. there, 17 April 1911. He was graduated from Columbia College in 1864, and at the College of Physicians and Surgeons in 1868. He was house physician and surgeon at Bellevue Hospital, New York, and later studied in Vienna, Heidelberg, Berlin, Utrecht, Paris and London, and was a pupil of Von Arlt, Graefe and Donders. He was surgeon to the New York Eye and Ear Infirmary, consulting ophthalmic surgeon to Saint Luke's and Presbyterian hospitals, and Saint Mary's Hospital for Children. He was professor of ophthalmology in Cornell University and ranked among the greatest oculists of his time. He became president of the American Ophthalmological Society in 1903–07. He wrote 'Eye Defects Which May Cause Apparent Mental Dulness and Deficiency in Children' (1901); 'Tuberculosis of the Eye' (1900); both in the 'Transactions' of the New York Academy of Medicine; 'Vascular Tumors of the Orbit' (1900), and other articles on his specialty in the 'Transactions' of the American Ophthalmological Society, the *Medical News* and *Medical Record*.

BULL, George Joseph, Canadian ophthalmic surgeon: b. Hamilton, Ontario, 16 Feb. 1848; d. 1911. He graduated at McGill University in 1869, studied in Paris, and began the practice of medicine in Montreal, devoting himself especially to diseases of the eye. He made his residence in Paris in 1886, and won celebrity as an expert in ophthalmic subjects. He wrote 'Ophthalmia and Optometry,' and many similar works.

BULL, John, English musician: b. Somersetshire, about 1563; d. Antwerp, 12 March 1628. He was appointed organist in the Queen's Chapel in 1591; first music lecturer at Gresham College in 1596; and organist to James I in 1607. A Catholic, he fled beyond the seas in 1613, and at Brussels entered the archduke's service. In 1617 he became organist at Antwerp Cathedral. Little of his music has been printed. The claim advanced for his authorship of 'God Save the King,' is unfounded.

BULL, John, the popular personification for the English nation. Its origin is obscure. Its first literary use appears to have been in Arbuthnot's famous 'History of John Bull,' written in ridicule of the Duke of Marlborough. The name is also used for an Englishman.

BULL, Ole Bornemann, Norwegian violinist: b. Bergen, 5 Feb. 1810; d. near there, 17 Aug. 1880. He went to Cassel in 1829, where for a short time he studied under Spohr, returning later to Bergen. He went to Paris in 1831, where at first he met with little success, being robbed of his few belongings, including his violin. His attempt at suicide at this time secured him a patroness, Mme. Villeminot, who provided him with a Guarneri instrument. He secured great triumphs both throughout Europe and in America by his remarkable playing, which won for him a distinct and unique position in the musical world as a virtuoso of extraordinary talent and a master of the violin. He overcame serious discouragements in preparing for his career, throughout which public interest and admiration were no less awakened by his manliness and grace of bearing than by his skill as a musician. At his début (Paris 1833) he was honored by the presence of Paganini, and that master was witness to the young aspirant's triumph. Bull afterward studied and turned to good account the method of Paginini. In business life he met with various successes and reverses. He lost all his money in a scheme to found a colony of his countrymen in Pennsylvania, and had to take to his violin to repair his broken fortunes. He afterward married in this country, settled at Cambridge, Mass., and retained a summer residence in Norway. He built a national theatre in Bergen and soon became involved in quarrels with the authorities. Consult 'Ole Bull: A Memoir' by Sara C. Bull (Boston 1883), and the Norwegian biography by O. Vik (Bergen 1890).

BULL (Lat. *bulla,* a knob, boss), a seal, usually of lead, appended to state documents to prove their authenticity. Such seals were used by the Roman Emperors, and by various monarchs during the Middle Ages. They finally went out of use in the northern countries but were retained in southern Europe where wax seals did not keep well. In form, the bull resembled a coin, being round with an inscription on each face. The best known seal of this type is the papal bull (q.v.).

BULL, a ludicrous speech in which the ideas combined are totally incongruous or contradictory. A good example is Artemus Ward's saying of Jefferson Davis that «It would have been money in Jefferson Davis's pocket if he had never been born.»

BULL, Golden. See Golden Bull.

BULL, Papal, an authoritative letter issued by the Roman pontiff acting in his official capacity as head of the Church. A Papal Brief is also an official letter of the pontiff of a less formal and weighty character, and differs in sundry particulars from the Bull, especially in its seal. The seal of the Bull, from which comes the name of the instrument, is a *bulla* or globular mass of lead on which is impressed the name of the reigning Pope, also those of Saints Peter and Paul, abbreviated, S. Pe, S. Pa. The material of the Bull is parchment, but of the Brief, white paper; and the seal of the Brief is of red wax, stamped with the Fisherman's Ring, which gives the impress of Saint Peter in a boat, fishing. There are other peculiarities in matter and manner distinguishing the Bull from the Brief, but it suffices to note the foregoing. Of Papal Bulls that have played a signal part in history, ecclesiastical or civil, especially worthy of mention are the Bull *Clericis laicos* (1296) of Boniface VIII by which the French clergy were forbidden to pay taxes to King Philip the Fair unless these were approved by the Pope; the Bull *Exsurge Domine* of Leo X against Martin Luther (1520); the Bull *In Coena Domini* against heretics and fautors of heresy, dating from the 15th century, but re-enforced by Pius V in 1571 and ordered to be publicly read in all parish churches yearly on Holy Thursday; the Bull *Unigenitus* (1713) against quietism and Jansenism; the Bull *Dominus ac Redemptor,* of Clement XIV, abolishing *the* Jesuit order (1773), and the Bull *Pastor æternus* (1870), which defined papal infallibility. The most complete collection of papal bulls is that by Cosquelines, Barberi and Gaude (28 folio vols., 1739–44 et seq.). There are several general or special collections. Consult Giry, 'Manuel de diplomatique' (Paris 1894).

BULL AND COW, the names given by English speaking races from time immemorial to the male and female respectively of bovine cattle. The words are probably imitative, the root-idea of «bull» being a suggestion of its bellowing; while «cow»—which in early English, as still in Scotch and some provincial dialects, is pronounced *coo* — is imitative of the lowing call to the calf. Since these animals have become domesticated, and most of the males have been castrated, the term has come to mean more particularly an unmutilated ox. On the other hand, the large size and robust qualities of the bull have led to a transference of the term to the males of various other animals having no zoological resemblance, or very little, to the cattle. Thus we speak of «bull and cow» elephants, moose, wapiti, seals, whales and even alligators; while various animals, as the bull-snake, take the name as expressive of some bull-like quality, as a habit of snorting, or because of horn-like appendages (for example, bullhead catfish).

BULL-BAITING, the sport of setting dogs on a bull, which was tied to a stake and torn to death for the amusement of the spectators. In this case the dogs, which were set upon the bull singly, were trained to seize the bull by the muzzle, technically, «to pin» the bull; but they were very frequently tossed on the horns of the animal. Sometimes also the bull was allowed to run loose in the arena, and then several dogs were set upon him at once. Bull-baiting was a favorite sport in England till about the time of George IV.

BULL-DOG, a dog of moderate size, derived previous to the 13th century, from a cross between the old British mastiff and the large pug of extreme southeast Asia. Both its ancestors still exist as separate breeds. An average mature specimen will weigh 40 to 50 pounds. They are squat and muscular in build, with short legs, rather higher behind than in the front, especially if the front legs are very much bowed. Their chests and heads are abnormally broad for their size. The lower jaw overlaps the upper and is of extraordinary strength. The teeth are large, especially the two canines, and very strongly fixed in the jawbone, giving the dog a holding power beyond that of any other breed. The coat is close and short. The most variable feature is the color, which ranges from all black to all white among dogs bred for show purposes, but a brindle is more natural. For many centuries this dog was used for «baiting,» or biting at, the bull, as a popular recreation; and up to more recent times men of brutal disposition used it for public dog-fights. It was through these exhibitions that the bull-dog got his bad name for temper, but now he is mainly kept as a watch-dog. In that capacity he is invaluable, and so gentle is his disposition that he is the safest canine companion for children. About the year 1900 a small variety of the bull-dog was evolved in the neighborhood of Brussels, but as it was first shown in Paris it has always been known as the «French» bull-dog. It is in the main a miniature of the English bull-dog, The most notable difference, other than that of size, being that the ears are shaped like those of a bat, and are carried erect, or «pricked,» giving the animal a very alert, sharp look.

BULL-FIGHT, a contest between men and bulls, conducted as a public spectacle. Once popular in Greece and Rome, this form of entertainment was introduced by the Moors into Spain and universally adopted in the cities of the kingdom, where, as well as in Mexico and some other parts of the world, it is still much in favor. The bull-fight is held in an arena of greater or less magnificence, called in Spanish the *plaza de toros*. The bulls are turned out, one by one, with many forms of pomp and solemn ceremonial, into the open space, where they are assailed, first by horsemen, called *picadores*, who attack them with the lance; then, when one or more horses have been wounded and one or more men have met with injury or perilous mishap — in which case a crowd of active footmen, called *chulos*, provided with crimson banners, take off the attention of the bull — the *banderilleros*, armed with sharp-barbed darts with fireworks and flags attached to them, worry the bull until he is covered with shafts, bleeding and scorched and his glossy hide becomes black and crisp from the explosion of the fire-works. Then comes the last act of the tragedy, when the skilful *matador* enters the arena slowly and alone, clothed in plain black and armed with a long, straight sword and a stick, called a *muleta*, with a piece of red silk fastened to it. With his sword he seldom fails to give the *coup de grâce* to the tortured bull, sheathing the blade, with one sure thrust, up to the hilt in his body just at the juncture of the neck and spine. Mules drag out the slaughtered carcass, amid the sound of trumpets and acclamations of the spectators; the dead or dying horses are removed, the arena is strewed with fresh sawdust, another bull is introduced, and so goes on the combat, until perhaps a dozen bulls and a larger number of horses have been slaughtered to delight the spectators. About 1,300 bulls and 6,000 horses are sacrificed annually in Spain to this sport. The Spanish settlers of Mexico and South America introduced bull-fighting to the New World. Consult Sancho, 'Machaquito y el renacimiento del toreo' (Madrid 1906).

BULL-FROG, a widely distributed, edible North American frog (*Rana catesbyana*) found in sluggish waters throughout the eastern half of the United States and Canada, and so called because of its loud, bass voice. It is from five to eight inches long, and of various shades of green, with the legs spotted. It lays its eggs in strings and the tadpole does not reach maturity until two years old. The same name is given by English-speaking people in various parts of the world to other large bellowing frogs, as the «bull-frog» of Siam and Malaya (*Callula pulchra*). See FROG.

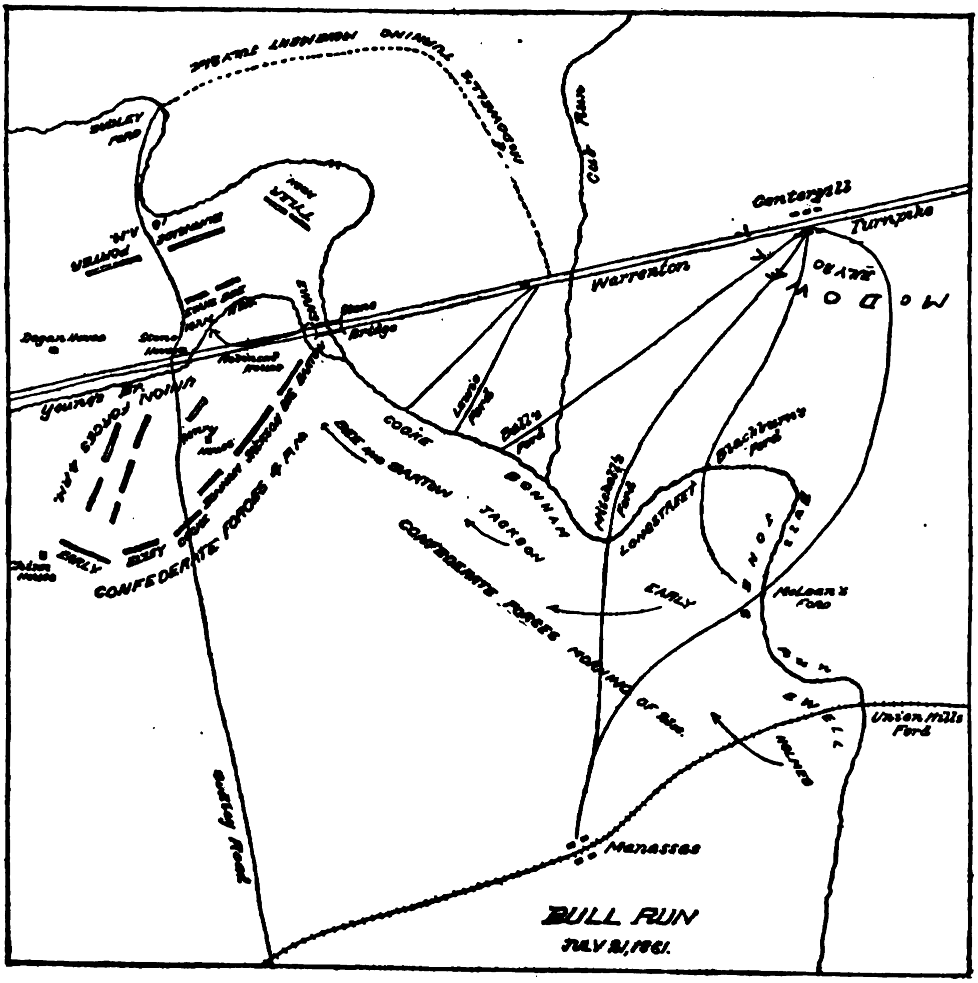
BULL MOOSE, a name applied to Theodore Roosevelt in 1912 and arising from his remark, «I feel as fit as a bull moose.» Through constant use of this animal's figure by the cartoonists in connection with Roosevelt's political campaign as the presidential nominee of the Progressive party, he became known as the «Bull Moose candidate» and the party as the «Bull Moose party.» See PROGRESSIVE PARTY.

BULL RUN, First Battle of. The first great battle of the Civil War occurred Sunday, 21 July 1861, in the vicinity of Manassas, Va. The Union forces were commanded by Brigadier-General Irvin McDowell, the Confederates by General Joseph E. Johnston, who had arrived from Winchester at noon of the 20th with nine regiments of his army and assumed command. The battlefield was west of Bull Run and near the crossing of that stream by the turnpike running nearly west from Alexandria to Warrenton. This road, a mile and a half west of the Stone Bridge by which it crossed Bull Run, unexpectedly to the Confederates, became the axis of the battle. Bull Run is a narrow, winding stream with rugged and mainly precipitous banks, but with numerous fords, flowing southeastwardly, being about 25 miles west of Alexandria and from three to five miles west of Manassas.

McDowell marched from his camps in front of Arlington and Alexandria on the afternoon of the 16th of July, with five divisions, commanded respectively by Brigadier-General Daniel Tyler, four brigades; Colonel David Hunter, two brigades; Colonel S. P. Heintzelman, four brigades; Brigadier-General Theodore Runyon, two brigades, and Colonel Dixon S. Miles, three brigades. The Fourth Division was left as a reserve in the region of Fairfax, guarding the lines of communication. The advance division, Tyler's, reached Centreville the morning of the 18th and sent a brigade to Blackburn's Ford in reconnoissance. After a sharp skirmish in which both sides lost about 60 men, it withdrew toward Centreville, to which point McDowell, hearing of the operations at Blackburn's Ford, concentrated four divisions.

Ford, Longstreet's at Blackburn's Ford, Bonham's between Mitchell's and Ball's fords, Cocke's at Lewis' Ford, and Evans' demi-brigade at the Stone Bridge forming the Confederate left. Of Johnston's Army of the Shenandoah, Jackson's brigade supported Bonham, and Bee and Bartow supported Cocke.

From each of these fords fair roads led to Centreville. General Beauregard had planned an attack upon Centreville which involved an advance of his whole force upon that point. This was officially approved by General John-



Theatre of First Bull Run Battle.

The Confederate "Army of the Potomac" had been concentrated at Manassas under General Beauregard. In expectation of a Union advance it occupied the south bank of Bull Run for eight miles from Union Mills Ford, at the crossing of the railroad to Alexandria, to the Stone Bridge, at the Warrenton turnpike, three brigades being thrown forward of that position, one of them to Fairfax Court House. These brigades fell back before the Union advance, skirmishing slightly. Ewell's brigade, the right of the line, was at Union Mills, with Holmes in support, Jones' brigade at McLean's

ston before daylight of the 21st, but at sunrise it was rendered impossible by McDowell's initiative. The plan was then changed to an attack on the Union left from Blackburn's Ford. This also was abandoned from the same cause.

McDowell, who had first intended to attack the enemy's right, after the affair at Blackburn's Ford, finding the ford at Sudley Spring two miles beyond the Confederate left, decided to attack from that direction. While Tyler feinted before the Stone Bridge, Hunter and Heintzelman, by a long detour, crossed at Sudley Spring and moved south toward the Warrenton turnpike in the enemy's rear. Evans, at the bridge, discovering the movement, withdrew 11 companies and formed them on a ridge half a mile north of the road as the head of Hunter's column entered the open fields which extended a mile north of the Warrenton road. Evans made stubborn resistance and was soon supported by Bee's brigade and Imboden's battery. While the position was hotly contested, the Confederates were pressed back down the hill, across the valley of Young's branch, a tributary of Bull Run, to the plateau south of it upon which were the Robinson and Henry houses. Two of Tyler's brigades crossed above the Stone Bridge and joined Hunter and Heintzelman in their advance. The fighting continued desperate until noon, and for new troops was, for both sides, most remarkable, but the Confederate line, though stubbornly contesting the ground, began to disintegrate, and the road to Manassas was crowded with retiring soldiers.

General Johnston describes the Confederate situation at two o'clock as «critical»; General Beauregard terms it a «pressing exigency» and speaks of the retirement of «our shattered battalions,» and of the fighting line as having «lost its cohesion.» Dr. Jones, Jackson's distinguished biographer, records that «the retreat became every moment more disordered,» that Bee's quick eye «now told him that all was lost» and that «he could not reform his line.»

At that hour a Union victory seemed assured. Johnston and Beauregard reached the position together. The troops on the line of Bull Run that had been held there by the demonstrations of two Union brigades designed to mask McDowell's turning movement were ordered in haste to the new line which was at right angles to the first. Jackson soon arrived with five regiments and two batteries. Hampton's Legion joined him and the Union advance was checked. Other arrivals strengthened the line. Kirby Smith's brigade of Johnston's army appeared about three o'clock, having just arrived on the field from Manasses, and pushed its three regiments toward the right of the Union line. Early's brigade of Beauregard's force, from the extreme right of his line, hastened beyond Smith's brigade, now commanded by Colonel Elzey, and, supported by Stuart's cavalry, appeared directly on the Union right flank. Two regiments from Bonham and two from Cocke also arrived upon the Union right. These also were of Beauregard's army. This turned the check which that portion of the Union line had received, first into retreat and then into a disorganized withdrawal, except that the rear guards maintained fair order till the columns were well off the field, the right retracing its long detour by Sudley Spring. At Cub Run, half-way to Centreville, the batteries of a pursuing column broke up the wagons and batteries on the bridge, compelling the abandonment of 13 guns. From this point the movement to the rear was still farther disorganized, to which condition the vehicles of many visitors, congressmen, correspondents and officials largely contributed. The attempt to rally the troops at Centreville failed, though General Johnston reported that the «apparent firmness» of the Union reserves at that point checked the pursuit. The army, in great part disorganized, streamed on to Washington.

After the severe stress under which the Confederate leaders found themselves from 11 o'clock until about 3, the sudden change on the Union side, first from assaulting to cessation of fighting; next, to a general retreat, and later to widespread panic, was as much a surprise to the enemy as to the Union commanders. It was not until the second day after the battle that the Confederates ascertained the full extent of the Union stampede. Upon this point President Davis wrote General Beauregard: «You will not fail to remember that, so far from knowing that the enemy was routed, a large part of our forces was moved by you in the night of the 21st to repel a supposed attack upon our right, and the next day's operations did not fully reveal what has since been reported of the enemy's panic.»

McDowell's strength at Centreville appears to have been about 28,000 men and 49 guns. His report says he crossed Bull Run with 18,000 men. A very careful estimate made from official records in 1884, by Gen. James B. Fry, McDowell's adjutant-general at the battle, gives the number actually engaged as 17,676.

General Beauregard reported his strength on the field when the battle opened as 27,833 and 49 guns; and after Johnston's delayed troops and Holmes' brigade had arrived in the afternoon as 31,972 and 57 guns. A very careful estimate by Gen. Thomas Jordan, his adjutant-general, fixed the number actually engaged at 18,053, thus showing the two sides to have been about equal on the firing line.

The Union loss as reported was: killed, 460; wounded, 1,124; missing 1,312; total, 2,896. Union guns captured or abandoned, 29.

The Confederate loss reported was: killed, 387; wounded, 1,582; missing, 13; total, 1,982.

It was called the «Battle of Manassas» by the Confederates. Consult Johnson and Buel, 'Battles and Leaders of the Civil War' (4 vols., New York 1887); Nicolay and Hay, 'Abraham Lincoln' (10 vols., New York 1890); Ropes, 'Story of the Civil War' (2 vols., New York 1898); and 'Official Records' (Vol. II, Washington 1880).

H. V. Boynton.

BULL RUN, Second Battle of, 30 Aug. 1862. When McClellan on the peninsula had reached the vicinity of Richmond, Lee, to prevent McDowell's corps at Fredericksburg from reinforcing McClellan, ordered Jackson in the Shenandoah to make a demonstration that should detain all available troops for the defense of Washington. Jackson advanced, and in a brilliant campaign drove Banks out of the valley and forced him across the Potomac. By a masterly retreat, he regained the upper valley in spite of McDowell and Fremont, and soon after appeared on McClellan's flank at Mechanicsville and participated in the seven days' battles.

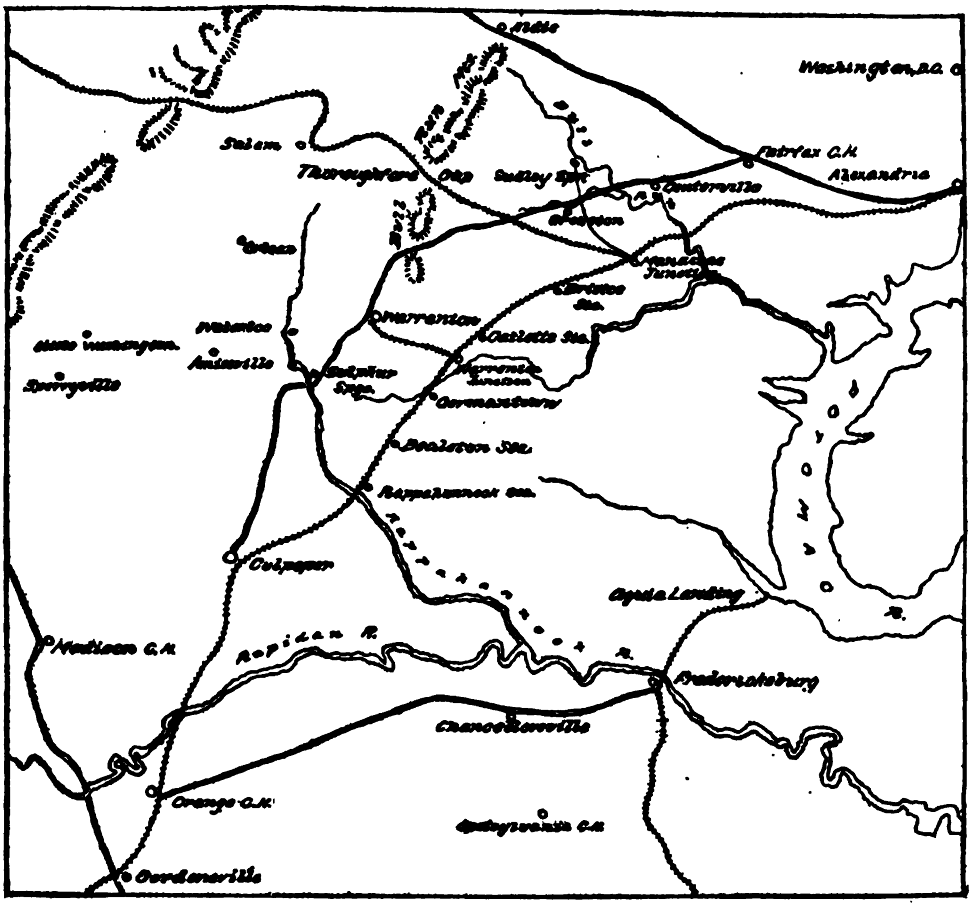
On 27 June the Union authorities united the three corps of McDowell, Fremont and Banks into the Army of Virginia under the command of Maj.-Gen. John Pope. He had concentrated his forces between Sperryville and Warrenton, and began to operate with his cavalry against Lee's railroad lines about Gordonsville. His mission also was to prevent Lee from concentrating upon McClellan, when he should withdraw from the peninsula. Lee promptly sent

Jackson's Division, followed by Ewell's and A. P. Hill's, to Gordonsville. On 7 August these moved from Gordonsville toward Pope's position at Culpepper, and 9 August encountered Banks at Cedar or Slaughter Mountain. Banks attacked, instead of holding his position as Pope's plan contemplated, and while at first brilliantly successful, he was at last defeated. Jackson, however, retreated on the 11th across the Rapidan.

On the 13th Lee ordered Longstreet, with his own and Hood's divisions, to Gordonsville. R. H. Anderson's division was ordered to follow. Upon their arrival Pope was largely outnumbered. Lee planned a move for the 18th against Pope's left, but this officer learned of the plan through the capture of Stuart's adjutant-general, recrossed the Rappahannock, and took position behind it on the 20th. Lee next arranged to cross at Sulphur Springs, turn Pope's right, and move upon his communications. This failed. Pope, at the same time, had planned to cross the river and attack Lee's right and rear, but a sudden flood prevented the movement. Lee then sent Jackson's corps far beyond Pope's right by way of Salem and Thoroughfare Gap to cut Pope's railroad line at Manassas. Jackson succeeded, passing around Pope's right, capturing Bristoe Station and Manassas with its immense supplies on the night of 26 August. Pope moved to attack him at Manassas. On the night of the 27th and early on the 28th, Jackson's three divisions withdrew by different roads, and soon after noon of the 28th assembled on the battlefield of the first Bull Run.

On the night of the 25th Pope's headquarters were at Warrenton Junction. Reynolds' Division had joined him on the 23d. On the 25th the advance of Heintzelman's corps arrived from the Army of the Potomac, Hooker's and Kearny's divisions, and Fitz-John Porter, with the divisions of Sykes and Morell of his corps. These two corps with Reynolds' Division were the only reinforcements that Pope received from the Army of the Potomac until after the battle of Manassas.

On the night of the 27th Pope, supposing Jackson at Manassas, ordered general concentration in that direction. Porter's failure to move promptly under this order constituted one of the charges under which he was subsequently court-martialed and cashiered. Ricketts' Division, the rear of McDowell's corps, upon the information from the cavalry that Longstreet's forces were entering Thoroughfare Gap, moved to the gap and held Longstreet back during the day, and into the evening of the 28th. In the



Theatre of Second Bull Run Battle.

afternoon of the 28th, Pope, supposing Jackson east of Bull Run, ordered his army to Centreville, Heintzelman and Reno by the fords of Bull Run, McDowell, Sigel and Reynolds by the Warrenton turnpike. The advance along the turnpike was begun without the knowledge that Jackson was just north of it on the first Bull Run field. The Union approach led Jackson to attack, thus revealing his position, which Pope had been vainly seeking. This was the battle of Gainesville, being a very bitter fight between Taliaferro's Division and two brigades of Ewell, and King of McDowell's advance.

After the close of the fight, in the absence of McDowell, his two divisions retreated, Rickett's to Bristoe Station, and King's to Manassas. At daylight of the 29th the Union forces were again put in motion to pursue Jackson. His line was mainly along an unfinished railroad, the left near Sudley Spring, and his right on high ground north of Warrenton road overlooking Groveton. The Union forces attacked throughout the day, with brief intermissions. The contest was desperate, and Jackson's line, though hard pressed at various points, maintained its organization. Porter's failure to here attack the Confederate right was another of the charges under which he was tried. Subsequently, however, he was exonerated by the findings of an army board, and restored to his rank by act of Congress. McDowell arrived late, with King's Division. As it moved into action it encountered the head of Longstreet's column, which had achieved its junction with Jackson. In less than an hour, in a bloody contest, Hood's Division of Longstreet's force had ended the battle of Groveton. Such were the preliminaries of the Second Bull Run.

The battle of Manassas, the Second Bull Run, was fought 30 August, the day following the action at Groveton. The movement covered the ground of McDowell's and Johnston's battle of the year before. Jackson's line occupied the position from Sudley Spring to the heights overlooking Groveton. Lee, whose forces were now all up, formed Longstreet's line across the Warrenton turnpike on high ground about a mile west of Groveton. On this ridge he established a number of batteries under Stephen D. Lee and Walton. The line then turned east south of the turnpike, and extended toward the Sudley Spring road. The Confederate position south of the Warrenton road seemed not to be suspected by Pope. The fact that after the action of the afternoon, before Jackson's troops had retired to their morning position, Lee had withdrawn Longstreet's advance to form on better ground, misled Pope and caused him to insist that the enemy was retreating. At noon, after reconnoissances north of the road, he therefore ordered vigorous pursuit. Porter was to push west on the Warrenton pike followed by King's Division on his right and Reynolds' on his left. Ricketts' Division, followed by Heintzelman's corps, was to pursue on the Haymarket road. Sigel's and Reno's corps were the reserves.

About four o'clock Porter advanced with his own corps and King's Division pushed in on Jackson's line with great vigor, and assault followed assault, each made with great pertinacity. Lee seemed willing to let them continue in order to exhaust his opponents. At length Jackson sent for help and Longstreet was ordered to his assistance. This officer had, however, posted his batteries so as to enfilade Jackson's front, and instead of sending troops, opened with a terrific flanking fire of artillery. The Union lines were repulsed with great loss. Nearly all of Pope's forces had been put in north of the turnpike and had been seriously repulsed. All Union support was now directed to defend the position against Longstreet's forces south of the Warrenton pike. The whole of Longstreet's line went forward toward the road with a rush. There were five divisions — Wilcox on the left, then Evans (Hood), Anderson, Kemper and Jones. As soon as Jackson, north of the road, saw the advance of Longstreet, he ordered his own line forward. The corps of Heintzelman and Reno resisted this attack, but were gradually forced back. The supreme struggle of the Union forces was to hold two elevated positions near the Henry and Chinn houses. The latter, known as Bald Hill, was carried by the Confederates after persistent and sanguinary fighting. The Henry house hill was held against repeated assaults. The Union army was in retreat across Bull Run, and the possession of the hill was necessary to maintain an orderly retreat.

The Union troops remained in possession until eight o'clock, when the last of Pope's army moved unmolested toward the Stone Bridge, crossing Bull Run about midnight. The bridge was then destroyed and the Union army concentrated at Centreville. It was a Union defeat, but not a rout. While there was much straggling, the main army had retreated in good order, and Lee did not pursue. In the management of the battle Lee had displayed his eminent generalship in a striking manner. Pope's chief error had been in persisting, before his attack was delivered, that the enemy was in retreat.

Pope was reinforced at Centreville by the strong corps of Sumner and Franklin from the Army of the Potomac. Here also he found supplies. His army had fought for two days almost entirely without food or forage. Lee began pursuit the afternoon of the day after the battle, Jackson leading from Sudley Ford and marching by a circuitous route toward Fairfax Court House, seven miles in rear of Centreville. Passing Chantilly, he turned toward the Warrenton turnpike and formed in front of Ox Hill, his right extending toward the pike. He was far in advance of Longstreet, and wholly without support. He was attacked by the two divisions of Reno under Stevens, and later by Kearny. Stevens and Kearny were killed, and Jackson was repulsed.

Longstreet came up at night, and at noon the next day (2 September), Pope's army was ordered by the authorities at Washington to withdraw within the defenses of the city. Pope's losses throughout the campaign from 16 August to 2 September were: Army of Virginia, killed and wounded 5,318, missing 2,787; Army of the Potomac, killed and wounded 3,613, missing 1,115; 9th Army corps, killed and wounded 1,204, missing 319; Kanawha division, killed and wounded 64, missing 42; total killed and wounded 10,199; captured or missing 4,263. The Confederate losses were not fully reported, but the best estimates placed them at about 8,500. There are no official returns which enable a presentation of the exact strength of either army during the campaign up to 30 August, but the best estimate places the Union forces at about 65,000 to 70,000, and the Confederate at 54,000.

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H. V. Boynton.

BULL-SNAKE, See Pine Snake.

BULL-TERRIER. See Terrier.

BULL-TROUT. (1) A salmon-like trout of North America. See Salmon-trout. (2) The Dolly Varden trout (q.v.).

BULLA, a genus of mollusks called, from the thinness of their shells, bubble-shells. The shell is oval, ventricose, convoluted externally, or only partially invested by the animal. The animal has a large cephalic disc bi-lobed behind; the lateral lobe is much developed. It occurs in temperate and tropical seas from 25 to 30 fathoms. Over 50 recent species are known and 70 fossil, the latter from the Oolite onward.

BULLACE, a small tree or shrub of the genus *Prunus,* prunes. It is a kind of plum, related to the sloe. In England its fruit is used for making jam. The tree is seldom found in America.

BULLÆ, miniature blisters, or blebs. They are larger than vesicles, with a large portion of cuticle detached from the skin and a watery transparent fluid between. The skin beneath is red and inflamed.

BULLANT, bü-län, **Jean,** French architect: b. probably in Ecouen about 1515; d. Paris, 10 Oct. 1578. He studied at Rome and after his return to France became supervisor of the royal buildings. He was connected with the erection of the Tuileries and built the pavilion named for him. He was also the architect of the Hôtel de Soissons for Catherine de Medici. In 1570 he succeeded Primaticcio at Fontainebleau.

BULLBAT, a name in the Southern States for the nighthawk (q.v.), a bird which flies in the dusk like a bat, and makes a booming sound.

BULLE, bül-lė, **Konstantin,** German historian: b. Minden, 30 March 1844. He studied philosophy and history at Jena and Bonn, taught in the high school at Bonn and became director of the gymnasium there in 1879. In 1887–90 he was a member of the Reichstag. After some philosophical studies he devoted himself to historical work and wrote ‘History of Recent Times 1815–71’; ‘History of the Years 1871–77’ and ‘History of the Second Empire and the Italian Kingdom.’ The first two were combined and published as ‘History of Recent Times’ in 1886.

BULLEN, Frank Thomas, English author and lecturer: b. Paddington, London, 5 April 1857; d. Madeira, 26 Feb. 1915. He received but scanty schooling, and after a few years' experience as errand boy, etc., went to sea as ordinary seaman in 1869, becoming chief mate after several years. He left the sea in 1883 and was junior clerk in the English meteorological office, 1883–99. His contributions to nautical literature have attracted widespread attention, the earliest of these, ‘The Cruise of the Cachalot’ (1898) being the most noted. His other books include ‘Idylls of the Sea’; ‘The Log of a Sea Waif’ (1899); ‘The Men of the Merchant Service’; ‘With Christ at Sea’; ‘A Sack of Shakings’ (1901); ‘The Apostles of the Southeast’; ‘Deep Sea Plunderings’ (1901); ‘A Whaleman's Wife’ (1902); ‘Sea Wrack’; ‘Sea Puritans’, ‘Our Heritage, the Sea’ (1906); ‘The Call of the Deep’ (1907). A volume of ‘Recollections’ was published posthumously.

BULLER, Sir **Redvers Henry,** English general: b. Devonshire 1839; d. London, 2 June 1908. He joined the 60th Rifles as ensign in 1858; in 1862 was promoted lieutenant, and eight years later captain. He was major in 1874, lieutenant-colonel in 1878, colonel in 1879 and major-general in 1884. He served with his regiment in the Chinese campaign of 1860, and in the Red River expedition in 1870. During the Ashantee war he acted as quartermaster-general and head of the intelligence department, and gained special mention for his behavior in several engagements. He also served with distinction during the Kaffir War of 1878, and the Victoria Cross was conferred on him in 1879 for his gallant conduct in saving the lives of two officers and a trooper of the Frontier Light Horse, during the retreat at Inhlobane in the Zulu campaign. He was chief of the staff to Sir Evelyn Wood in the war against the Boers in 1881 and in Egypt in the following year, gaining special distinction for his services at Kassassin, Tel-el-Kebir and elsewhere. In the Sudan campaign of 1884–85 he was chief of the staff to Lord Wolseley, and was in command at the battle of Abu-klea after Sir Herbert Stewart had been wounded. From 1887 till 1890 he held the post of quartermaster-general of the army, and from 1890 till 1897 he acted as adjutant-general to the forces. In 1886–87 he was under-secretary to the lord-lieutenant of Ireland, and in 1891 was promoted to the rank of lieutenant-general. He was created K.C.M.G. in 1882, K.C.B. in 1885 and G.C.B. in 1894. In 1899 he went to Natal as commander in the war with the Boer republics, and succeeded in relieving Ladysmith after it had been besieged 118 days. His various reverses prior to this event caused him to be superseded by General Roberts, and on his return to England he was placed on the retired list in consequence of an unwise speech. The publication of official documents, still later, practically destroyed his reputation as a commander, it being shown by these that he had advised General White, the defender of Ladysmith, to give up the defense and surrender to the Boers.

BULLERS OF BUCHAN, a large oval cavity in the rocks on the east coast of Aberdeenshire, about six miles to the south of Peterhead, forming a sort of pot or caldron about 150 feet deep, open to the sky above and communicating with the sea below by a natural arch or horizontal passage, into which the waves often rush with a tremendous noise.

BULLET. A projectile discharged from a musket, fowling-piece, pistol or similar weapon. When the smooth-bore arms alone were used, the bullets were made by casting. Molten lead was poured into molds and the molds were dipped in cold water, to hasten the solidification of the lead. The molds were cooled after using a few times, and the lead was heated only just to the degree for maintaining fluidity. Bullets are now, however, made more expeditiously, and more truly spherical in form, by compressing machines. The lead is first fashioned into a rod about a yard long by five- or six-eighths of an inch thick; this rod is passed between rollers to condense it; then between other rollers to press it into a row of nearly globular pieces; then a spherical die gives the proper form to each of these pieces; and, lastly, a treadle-worked punch separates them into bullets. With one of these machines and two dies, nine boys can make 40,000 bullets in a day.

Kinds and Sizes.— Spherical bullets for the old muskets, carbines and pistols varied from 14 to 20 to the pound, and from .60 to .68 of an inch in diameter. There is a particular ratio, depending on the specific gravity of lead, by which the number to the pound will give the diameter, or vice-versa. Such bullets are, however, becoming every year less and less used, being superseded by other forms better suited for rifles. Robins' bullet was egg-shaped, with the centre of gravity at the larger end; Beaufoy's was ovoid, with a hemispherical cavity at one end; Manton's was a spherical ball put into a wooden cup, with projections on the exterior; Greener's was oval, with a plug of mixed metal driven into a hole barely large enough for it; Norton's, Delvigne's, Minié's, and others of various elongated shapes, mostly with some kind of plug, which, driven into the lead by the force of the explosion, causes it to fill up the grooves in the rifling of the barrel.

Since the advent of powder and ball, there have been thousands of varieties of all sizes and imaginable shapes, round and long, with points of every conceivable curve that can be geometrically figured, some with a flat base, others with depressions of all depths and shapes, some to be patched with paper, or covered with steel, copper or nickel, others with grooves, the width, depth and number of them varying according to the theories of many scientific men. The manufacturers of the various arms have by a long series of experimenting decided upon a standard size of bullet to be used in their different calibres, and the manufacturers of ammunition make the bullets to that standard and they will not vary .001 of an inch as they come from the factory. There are, however, some who differ in their opinions as to what diameter of a bullet should be for their rifles; they will push a bullet through the barrel, and if the impressions of the rifling on it are not deep enough to suit their ideas, they decide that a bullet of the standard size is not large enough and may condemn the mold. Others there are who desire to have their bullets smaller than the standard size and point to their fine records to prove that they are correct. Of course, a bullet should fit so as absolutely to prevent the escape of the gas by the side of the bullet; all pressure generated by the ignition of the powder should be kept at the base of the bullet to expel it. If gas escape through the barrel past the bullet, so much force is lost, and if the escapement is greater on one side than on the other, it will deflect the bullet and make the flight irregular, and accuracy under such conditions is out of the question. A bullet when seated in the barrel by hand should fit to the bottom of the rifling so as to shut off all gas before the powder is ignited. As to how a bullet of the standard size will fit a barrel depends wholly upon the bore and the depth of the rifling. Variations in both of these points are found, as well as in everything else; there are no two rifle barrels alike any more than there are two human beings; each has its own individuality and must be humored in accordance with its peculiarities. The bore of a rifle is the size of the smooth hole in the barrel before it is rifled, which is commonly called the calibre; this, however, is not the size of the bullet. The diameter of the bullet is determined by the depth of the rifling and should be large enough to shut off the gas. The depth of the grooves in the ordinary rifle barrel is from .001 to .004 of an inch according to the ideas of the various manufacturers. It must be remembered that it is the barrel, not the shells, that the bullet should fit properly to get good results. A reloading tool should have a bullet sizer as well as a bullet mold combined with the loading chamber in a convenient and handy form. The molds thus can be made so as to cast the bullets a trifle above the standard size, allowing the use of any mixture of metal that the shooter desires; and, after the lubrication is in the grooves, they can be forced through the sizing die, this will press the lubrication solidly into the grooves, wipe off all surplus grease and at the same time make the bullet perfectly round.

Bullets to be patched with paper are smooth, without grooves. They are from three- to six-thousandths of an inch smaller than the standard size. The diameter is increased to the size desired by having a thin paper patch rolled around them, covering about two-thirds of the bullets from the base up. This paper is of fine, strong texture, similar to bank-note paper. It is specially prepared for this purpose, and is made in different thicknesses, which are known to the manufacturers of ammunition as extra-thin, thin, medium and thick. The extra-thin is about one and one-half thousandths of an inch thick and there is an increase of about one-half thousandth in each succeeding size; thus shooters wishing to increase or decrease the diameter of their bullets can do so by selecting the proper thickness of paper. There is a difference of opinion relative to the superiority of patched bullets over grooved, yet for hunting or military purposes the grooved ball is generally preferred, as such ammunition can be carried and exposed to wet weather without injury, while a part of the patch being exposed is liable to get wet and injured so as to impair its accuracy. Still, for fine target-shooting, the patched bullet properly handled is, without doubt, preferable.

Expansive Bullets.— Expansive bullets, more appropriately called *deformative* bullets, alter their shape upon impact with the tissues of the body. All unsheathed lead bullets are of this class, and sheathed bullets are often made deformative by various devices. Among these are the split-nosed, hollow-nosed and soft-nosed bullets. They are often erroneously called «dum-dum,» from the fact that the original deformative bullets were made at Dum-Dum, the fact that principally hard-nosed bullets are made at that place being overlooked.

Explosive Bullets.— Explosive bullets contain a charge of explosive which is detonated on impact, and, exploding, cause great wounds, instantly fatal. They are used only in big-game hunting. Stories of their use in warfare are misstatements, due to ignorance of what constitutes such a bullet. The modern Spitz-Geschoss bullet of the Germans produces less dangerous wounds than the Mauser of 1888. It has a remarkably flat trajectory, its height being only 11.75 inches at a range of 400 yards, as compared with 28 inches for the Lee-Metford of the English.

Bullets are now made with extraordinary speed, by machinery of beautiful construction. The machine draws in a coil of leaden rod, unwinds it, cuts it to the required length, stamps out the bullets with steel dies, drops them into boxes and conveys them away. Each machine, with four dies, makes 7,000 bullets per hour; and four such machines, in an easy day's work, turn out 300,000 bullets. So nearly are the machines automatic that one man can attend them all. Modern rifle bullets have a pressed leaden or steel core, and a thin covering of steel, copper or nickel. A combination of copper and nickel, known as cupro-nickel, is very generally employed, as it is without the poisonous qualities of copper used alone. See AMMUNITION; CARTRIDGES; PROJECTILES; SMALL ARMS.

BULLET-TREE, or **BULLY-TREE** (*Mimusops balata*), a forest tree of Guiana and neighboring regions, family *sapotaceæ*, yielding an excellent gum known as balata, having properties giving it in some respects an intermediate position between gutta-percha and india-rubber, and making it for certain industrial purposes more useful than either. The timber of the tree also is valuable.

BULLFINCH, a European finch (*Pyrrhula Europæa*), of plump form, and a favorite cage-bird. It is a soft gray above, with shining black cap, wings and tail, and, in the male, has a rich rose breast (gray in the female). Its native call is a clear piping; and birds in captivity are trained to whistle simple tunes and bring a high price in the bird market.

BULLHEADS, or «horned-pouts,» are small, dark-colored catfish, abundant everywhere east of the plains, and, by introduction, in California and Oregon. They are mud-loving fishes, remaining on the bottom and feeling for food with the barbels, one on each side of the mouth and two under the chin. The «common bullhead» (*Ameiurus nebulosus*) varies in length, at full age, from 18 to 24 inches and occasionally weighs five pounds. It is brownish-black in color, with a fine, scaleless, rubber-like skin, a big head and a long upper jaw. It is a gluttonous biter, gorging the bait, so that the hook must often be cut out of its interior. A smaller species, the black bullhead (*A. melas*), may be distinguished by the smaller anal fin and its nearly white rays. The southern «flat-headed cat» (*A. platycephalus*) has an eel-like form and a greenish brown hue, and is almost entirely herbivorous. Several of the large «catfish» (q.v.) of the western lakes belong to this genus.

BULLIER ADVERTISING AGENCY, the most noted concern for the handling of advertising in France. In 1856 it entered into a working agreement with the Havas agency for the mutual selling of news and advertising together. This agreement strengthened both companies and made of them the strongest institution of the kind in Europe. See PRESS ASSOCIATONS.

BULLINGER, Heinrich, Swiss reformer: b. Bremgarten, 18 Aug. 1504; d. Zürich, 17 Sept. 1575. He studied first at Emmerich, in the duchy of Cleves, and afterward at Cologne. His intention was to become a Carthusian monk, but after perusing the writings of Melanchthon and other reformers he changed his views, formed a close connection with Zuinglus, became one of the most strenuous supporters of his views, and ultimately succeeded him in his charge of Zürich. He was one of the authors of the first Helvetic Confession, drew up in concert with Calvin the formulary of 1549, by which the differences between the churches of Zürich and Geneva on the subject of the Lord's Supper were happily terminated, and kept up a close correspondence with the principal English reformers. The Zürich Letters lately published by the Parker Society contain part of this correspondence, and, among others, letters addressed to him by Lady Jane Grey. The most important of his many writings is a 'History of the Reformation.' See lives by Hess (1828–29); Pestalozzi (1858); also Heinrich, 'Bullinger und seine Gattin' (1875); Zimmermann, 'Die Züricher Kirche und ihre Antistes' (1877).

BULLION, uncoined gold or silver in bars, plate or other masses, which has been reduced to the standard fineness of the coinage of a country, but is sometimes used to designate the metals generally, whether coined or uncoined. United States standard bullion contains 900 parts of pure gold or pure silver, and 100 parts of copper alloy. The coining value of an ounce of pure gold is $20.67183, and the coining value of an ounce of standard gold is $18.60465. The coining value in standard silver dollars of an ounce of pure silver is $1.2929, and the coining value of an ounce of standard silver is $1.1636. The word bullion was of frequent use in the proceedings respecting the Bank of England from 1797, when the order of council was issued that the bank should discontinue the redemption of its notes by the payment of specie to 1823, when specie payments were resumed; for, by a previous law, the bank was authorized to pay its notes in uncoined silver or gold, according to its weight and fineness. The investigations of the bullion committee, and the various speculations on the subject of bullion, related to the supply of gold and silver, whether coined or not, as the basis of the circulating medium. The discovery of the mines in America did not at first add materially to the stock of bullion in Europe. The total addition for the first 54 years was about $85,000,000; not quite so great an amount of value (in gold at least) as Russia has obtained from the Ural mines in less than half the time. The average annual supply from all the American sources during the 54 years from 1546 to the end of the 16th century was rather more than $10,000,000. During the 17th century the annual average was about $16,250,000; in the next half century it was $27,500,000; and in the years 1750 to 1803 it was $38,000,000. In the decade 1901–10, imports of gold, chiefly bullion, into the United States ranged from a minimum of $43,339,905 in 1910 to a maximum of $148,337,321 in 1908. The extremes of exports were $38,573,891 in 1906 and $118,563,215 in 1910.

BULLIONS, Peter, American philologist: b. Moss Side, Scotland, December 1791; d. Troy, N. Y., 13 Feb. 1864. Educated at Edinburgh University, where he studied theology, he came to America in 1817. He was pastor of the Presbyterian church at Argyle, N. Y., for six years, and from 1824 to 1848 taught languages in the Albany Academy and was, from 1832 to his death, pastor of the United Presbyterian congregation at Troy, N. Y. His published works include 'Life of Alexander Bullions,' (1840); 'Principles of English Grammar' (1834); 'Principles of Greek Grammar'; 'Analytical and Practical English Grammar' (1853); 'Principles of Latin Grammar' (1853); 'Latin and English Dictionary' (1862).

BULLOCK, Charles Jesse, American economist: b. Boston, 21 May 1869. He was graduated at Boston University in 1889, taught in secondary schools for four years and then pursued graduate studies in political economy and political science, receiving the degree of Ph.D. in 1895 from the University of Wisconsin. After holding an instructorship in political economy at Cornell University from 1895 to 1899, he was appointed assistant professor, and later professor, of political economy at Williams College, where he taught from 1899 to 1903. In 1903 he became assistant professor, and in 1908 professor, of political economy at Harvard University. He served as a member of the commission appointed to codify and revise the taxation laws of Massachusetts in 1907, and of the commission appointed in 1913 to draft a forest tax law, which was enacted in 1914. In 1916 he was elected vice-president of the National Tax Association. His best writing is in the field of financial history and theory, especially the finances of the United States between 1775 and 1789 (*University of Wisconsin Bulletin,* 1895). He is the author of 'The Finances of the United States 1775–1789' (1895); 'Introduction to the Study of Economics' (1897); 'Essays on the Monetary History of the United States' (1900); 'The Finances and Financial Policy of Massachusetts' (1907); and has edited 'Currencies of the British Plantations in North America' (1897); 'Selected Readings in Public Finance' (1906); 'Selected Readings in Economics' (1907).

BULLOCK, Rufus Brown, American statesman: b. Bethlehem, Albany County, N. Y., 28 March 1834; d. Atlanta, Ga., 27 April 1907. He was graduated at Albion Academy in 1850, and, after various pursuits, was sent during 1859–60 to organize the business of the Adams Express Company in the South Atlantic States. His headquarters were at Augusta, Ga., where he formed the Southern Express Company and became one of its active managers. During the Civil War he continued this occupation under the direction of the Confederate government establishing railroad and telegraph lines on interior routes. Later he was placed in charge of contributions for the officers and men of the Army of Northern Virginia, and at Appomattox he gave his parole as acting assistant quartermaster-general. After the cessation of hostilities he resumed the general management of express affairs and was elected one of the trustees and secretary of the Southern Express Company. He was also associated in the organization of the First National Bank of Georgia and was elected president of the Macon and Augusta Railroad. In 1867 he was chosen a delegate to the convention called to frame a constitution under the reconstruction laws then recently passed. His course at that convention met with the approval of its progressive members and he was their unanimous choice as candidate for governor. After a bitter canvass in the spring of 1868 the new constitution was ratified and Bullock was declared elected. But the reactionists obtained a majority in the legislature and expelled the colored men who had been elected and seated. Against this action the governor protested, and after its accomplishment brought the matter to the attention of Congress, by which he was empowered to reassemble the old legislature, including the expelled colored members. This struggle for the rights of negroes to hold office rendered him very unpopular in his State, and he was overwhelmed with abuse. At the next regular election the opposition seated a large majority of the general assembly, and just prior to its convening in November 1870 Governor Bullock resigned his office. Charges of corruption were made against him, and, after a hearing in the State courts at Atlanta, he was acquitted and thoroughly vindicated. He continued his residence in Georgia and became president of one of the largest cotton mills in Atlanta. For several years he was prominent in public service; as a trustee of Atlanta University, president of the Atlanta Chamber of Commerce, vice-president of the Cotton States Exposition and government director of the Union Pacific Railroad.

BULLOCK, Shan F., Irish novelist: b. Crom, Fermanagh, Ireland, 17 May 1865. He has written a number of popular works. Among them are 'The Awkward Squads' (1893); 'By Thrasna River' (1895); 'Ring o' Rushes' (1896); 'The Charmer' (1897); 'The Barrys' (1899); and 'Irish Pastorals' (1901); 'The Squireen' (1903); 'Dan the Dollar' (1905); 'A Laughing Matter' (1908); 'Thomas Andrews, Shipbuilder.' His work is remarkably individual and his studies of life in the north of Ireland are faithful reflections of Irish life and character.

BULLOCK, William A., American inventor: b. Greenville, Greene County, N. Y., 1813; d. Philadelphia, 14 April 1867. He learned the trade of machinist, and having started a periodical, *The Banner of the Union*, he invented a printing-press in connection with that enterprise. He removed to New York and devoted himself to the construction and gradual development of a «planetary press,» finally producing the Web perfecting press that delivers 30,000 papers per hour, printed, cut and folded. While handling one of his presses he met with an injury that proved fatal.

BULLS AND BEARS, a popular phrase used in connection with the stock market. The term «bulls» is applied to the operators attempting to force up prices, and the term «bears» to those seeking to lower them.

BULL'S HORN CORALINE (so named because the shape of the cells is like a bull's horn), a zoophyte of the family *Cellariadæ*. It is the *Eucratia loricata*. It is branched subalternate, and has the cells conical, with a raised orifice, beneath which is a spinous process.

BULNES, bool-nās, **Manuel,** Chilean soldier and statesman: b. Concepcion, 25 Dec. 1799; d. Santiago, 18 Oct. 1866. He served in most of the battles of the Chilean revolution. In 1838 he commanded the Chilean army of 5,000 men against Santa Cruz, in Peru, and was finally instrumental in driving Santa Cruz from the country and breaking up the Peru-Bolivian confederation. In 1841 he was elected President of Chile and served for four years. He was afterward senator and councillor of state.

BÜLOW, bü'lō, **Bernhard,** PRINCE VON, German statesman: b. Klein-Flottbeck, Holstein, 3 May 1849. He came of a distinguished family, and was, on the mother's side, of Danish ancestry. He was educated at Lausanne, Leipzig and Berlin, studied law and served in the Franco-German War, where he rose to the grade of lieutenant After being secretary of legation at Rome, Saint Petersburg and Vienna, he became chargé d'affaires at Athens during the Russo-Turkish War, and later was secretary of the Berlin Congress. In 1888 he was appointed Minister to Rumania, and in 1893 Ambassador to Italy. He was called home to become Minister of Foreign Affairs. His skilful treatment of the Samoan difficulty won him popular favor in his own country. During the Chinese complications in 1900 he fully supported the Emperor's foreign policy. When Prince Hohenlohe resigned, 16 Oct. 1900, Von Bülow was called to succeed him as Chancellor of the empire. His diplomacy was shaped on the whole in accordance with ideas of his Imperial master. In 1905 he set in motion a campaign against the ambitions of France in Morocco which led to the fall of the French Foreign Minister Delcassé and the meeting of the Algeciras conference in 1906. He was raised to the princely rank in 1905. He was especially skilful in controlling a majority in the Reichstag among the different factions until the failure of his budget proposals which led to his resignation in 1909, when he was succeeded by Von Bethmann-Hollweg. He has opposed many of the latter's policies and criticized as inimical to the empire his utterances in the Reichstag on the German conditions of peace.

BÜLOW, Dietrich Adam Heinrich von, German military writer: b. Falkenberg, in Altmark, about 1757; d. Riga, Russia, 1807. He studied in the military academy at Berlin, and afterward entered the Prussian service. But he soon retired, and occupied himself with the study of Polybius, Tacitus and J. J. Rousseau, and then served for a short period in the Netherlands. He afterward undertook to establish a theatre, but immediately abandoned his project, and visited the United States, whence he returned poor in purse but rich in experience, and became an author. His first work was on the 'Art of War,' in which he displayed uncommon talents. He wrote a book on 'Money,' translated the 'Travels of Mungo Park,' and published, in 1801, his 'History of the Campaign of 1800.' He lived a time in London, was there imprisoned for debt, and afterward removed to Paris, whence he was banished in 1804. In 1804 he wrote 'Lehrsätze des neuern Krieges' ('Theory of Modern Warfare') and several other military works, among which is his 'Tactics of the Moderns as They Should Be.' In the former he points out the distinction between strategy and tactics, and makes the triangle the basis of all military operations. This principle of his was opposed by Jomini and other French writers. His history of the war of 1805 occasioned his imprisonment in Prussia, at the request of the Russian and Austrian courts. He died in the prison of Riga. He was a follower of Swedenborg. Consult Cammerer, 'Development of Strategical Science' (London 1905).

BÜLOW, Friedrich Wilhelm (COUNT VON DENNEWITZ), Prussian general: b. Falkenberg, 16 Feb. 1755; d. Königsberg, 25 Feb. 1816. In his 14th year he entered the Prussian army. In the war of 1806 he was a lieutenant-colonel at the siege of Thorn, and distinguished himself in various battles. In 1808 he was made major-general and general of brigade. When the war against France broke out in 1813 he fought the first successful battle at Möckern, 5 April; 2 May took Halle, and protected Berlin from the danger which threatened it, by his victory at Luckau 4 June. He saved Berlin a second time by the memorable victory over Oudinot of Grosbeeren, 23 August, and relieved the same city a third time by the great victory over Ney at Dennewitz. For this service the King made him one of the few grand knights of the Iron Cross, and after the end of the campaign bestowed on him the title Count Bülow of Dennewitz, and made the same hereditary in his family. At the storming of Leipzig, 19 October, he took an important part. At the opening of the campaign of 1815 he received the chief command of the fourth division of the army, with which he contributed so essentially to the victory of Waterloo, that the King gave him the command of the 15th regiment of the line, which was to bear in future the name of the Regiment of Bülow von Dennewitz. Consult Bülow, 'Generalfeldmarschall Graf Bülow v. Dennewitz' (Vienna 1910).

BÜLOW, Hans Guido von, German pianist and composer: b. Dresden, 8 Jan. 1830; d. Cairo, Egypt, 12 Feb. 1894. He studied the piano under Liszt, and made his first public appearance in 1852. In 1855 he became leading professor in the Conservatory at Berlin; in

1858 was appointed court pianist; and in 1867 became musical director to the King of Bavaria, followed by a series of concerts in Germany, Italy, Russia, England and the United States, which he first toured in 1875–76. In 1878 he became musical director at Court Theatre; from 1880–85 was Hofmusikintendant to the Duke of Meiningen. From 1886 till his death he was conductor of the Philharmonic Society, Hamburg. His compositions include overture and music to 'Julius Cæsar,' 'The Minstrel's Curse' and 'Nirvana'; songs, choruses and pianoforte pieces. He was considered one of the first of pianists and orchestral conductors remarkable for the range of his repertoire and for his retentive memory, playing and conducting without book. He was the greatest living authority on Beethoven, and edited an edition of his works. His 'Letters,' edited by his widow, appeared 1895–97; and 'Lives' by Raumann (Berlin 1906) and La Mara (Leipzig 1911).

BÜLOW, Karl Eduard von, German author: b. Berg vor Eilenburg, Saxony, 17 Nov. 1803; d. Ottishausen, 16 Sept. 1853. He studied at the University of Leipzig, and became the friend and imitator of Ludwig Tieck. His literary fame rests mainly on his 'Book of Tales,' after ancient Italian, Spanish, French, English, Latin and German originals (4 vols., 1834–36), which was followed by a supplementary volume (1841). Of his own original compositions, the 'Springtide Wandering Among the Hartz Mountains' is one of the best. He wrote also the very interesting story of 'The Youth of a Poor Man of Toggenburg,' founded on the autobiography of Ulrich Bräker, a Swiss weaver. He published the original later.

BÜLOW, Margarete von, German novelist: b. Berlin 1860; d. near there, 2 Jan. 1885. Her early years were spent partly in Thuringia and partly in Smyrna, where her father was Prussian consul. Her published works include 'Stories' (1885); 'Jonas Briccius' (1886); 'Herr im Hause' (1886); 'Chronicle of the Riffelshausen Folks' (1887); 'New Stories' (1890). She delineated character with great precision, and displayed true insight into the human heart. She lost her life in an attempt to rescue a boy from drowning in the Rummelsburger Lake.

BULOZ, bü-lō, **François,** French publicist: b. Vulbens, Savoy, 20 Sept. 1803; d. Paris, 12 Jan. 1877. In 1831 he became editor of the *Revue des Deux Mondes,* the celebrated French fortnightly literary magazine, which, under his direction, increased its subscription list from 350 to 18,000. It published the works of de Vigny, de Musset, George Sand, and rendered remarkable service to the encouragment of contemporary literature. From 1835–45 he also edited the *Revue de Paris.* For 10 years (1838–48) he was director of the Comédie Française.

BULRAMPUR, bool-rŭm-poor', a town of India, in the Fyzabad division of Oudh, the residence of the Maharaja of Bulrampur. It has a trade in rice, etc., besides manufactures of cotton and other articles.

BULRUSH, a popular name for tall, reed-like plants which grow in marshy places, and which for the most part belong to the genus *Scirpus.* The common bulrush is frequent in clear waters and about the borders of rivers throughout Europe, as well as in North America and New South Wales. The roots are thick and stout, creeping under water in the deep mud; the stems are of a dark-green color, and four or five feet or more in height, and are naked, smooth, round, tough, pliant and spongy within. Their base is covered with several sheathing scales, partly ending in leafy points. They are useful for packing and thatching, and especially for plaiting into the bottom of chairs.

BULTHAUPT, boolt'houpt, **Heinrich Alfred,** German poet and dramatist: b. Bremen, 26 Oct. 1849; d. 1905. On quitting the university he was for a while a private tutor; then traveled in the East, Greece and in Italy. He was a lawyer in his native town for some years, and in 1879 became custodian of the city library. Of his dramatic compositions the list is very long, comprising tragedies, 'Saul' (1870); 'A Corsican Tragedy' (1871); plays dealing with the questions of the time, 'The Workmen' (1876); comedies, comic operas, including 'Die Kopisten' (1875); 'Lebende Bilder' (1875); 'Ahasver' (1904). He wrote the text for oratorios by Bruch and Vierling, adaptations of Shakespearean dramas ('Cymbeline' 1885; 'Timon von Athen' 1894); he also wrote 'Durch Frost und Gluten' (1892, new ed., 1904), and several works of criticism, especially 'Shakespeare und der Naturalismus.' His special distinction, however, is as author of 'Dramaturgy of the Theatre'; 'Dramaturgie der Klassiker' (1882 et seq.), a work of exceeding value which has been reprinted frequently under the title 'Dramaturgie des Schauspiels'; also 'Dramaturgy of the Opera' (2 vols., 1887). Consult Kraeger, H., 'Litterarische Vorträge aus dem Nachlass ausgewählt und durchgesehen' (Oldenburg 1912).

BULWER, John, English physician and author. He flourished in the 17th century and appears to be entitled to the honor of having first pointed out a method of instructing the deaf and dumb. His works include 'Philosophus, or the Deafe and Dumbe Man's Friend' (1648); 'Chironomia, or the Art of Manual Rhetoric'; 'Chirologia, or the Natural Language of the Hand' and 'Anthropometamorphosis.'

BULWER, William Henry Lytton Earle (BARON DALLING AND BULWER), English author and diplomat, brother of Sir Edward Bulwer-Lytton (q.v.): b. London, 13 Feb. 1801; d. Naples, 23 May 1872. He was educated at Sunburg, Harrow and Cambridge. He became agent for the London Greek Committee in 1824, and made a journey to the Morea, which he later described in 'A Journey to Greece.' He entered the army, but resigned to enter the diplomatic service, and after 1827 was successively in Berlin, Brussels and The Hague. In 1830 he was elected to Parliament as an advanced Liberal and in 1837 was made secretary of the embassy at Constantinople, where he concluded an important commercial treaty with Turkey. He was Minister to Madrid in 1843, and concluded the peace between Spain and Morocco in 1844. Disliked by Narvaez, the soldier-dictator, Bulwer was ordered to leave Spain. Parliament approved of his conduct and he was awarded the highest decoration of the Order of the Bath; in 1849 had a diplomatic mission to Washington, and was one of the negotiators of the Bulwer-Clayton Treaty (q.v.). In 1852 he was envoy extraordinary to Tuscany and in 1856 was sent to Bucharest to investigate the conditions of the Danubian principalities, and was Ambassador to Turkey in 1858–65. He was created Baron Dalling and Bulwer in 1871. His works include ‹An Autumn in Greece› (1826); ‹France, Social, Literary and Political› (1834–36); ‹Life of Byron› (1835); ‹Historical Characters› (1868–70); ‹Life of Palmerston› (1870–74).

BULWER-CLAYTON TREATY, a treaty negotiated at Washington, D. C., in April 1850, by John M. Clayton, Secretary of State under President Taylor, and Sir Henry Bulwer, British Minister to the United States. It provided that neither the United States nor Great Britain should attempt to control a proposed canal across Nicaragua. The treaty provided further for the neutrality of the canal and it guaranteed encouragement to all lines of interoceanic communication. The terms of the treaty were afterward much disputed. In 1882 the United States government intimated to Great Britain that the canal having become impracticable because of reasons for which Great Britain alone was responsible, the United States considered the treaty as no longer binding, but Great Britain continued to hold it as in force. On 3 March 1899, Congress passed a bill providing for the construction of a canal on the Nicaragua route, which also authorized the President to open negotiations with Great Britain for the abrogation of the Bulwer-Clayton Treaty, and under the last clause a convention between the two countries, abrogating portions of the treaty deemed to be against the interests of the United States, was signed in Washington, 5 Feb. 1900. For a complete account see Clayton-Bulwer Treaty.

BULWER-LYTTON, Edward George Earle (1st Lord Lytton), English politician and novelist: b. London, 25 May 1803; d. Torquay, Devonshire, 18 Jan. 1873. The Bulwers, long settled at Heydon Hall, Norfolk, claimed descent from the Normans and Vikings, perhaps as a ready explanation of their bold and turbulent spirit. The novelist's father, William Earle Bulwer, was colonel of the 106th regiment or Norfolk rangers. His mother, Elizabeth Barbara, was the only daughter of Richard Warburton Lytton of Knebworth in Hertfordshire, the family seat since the time of Henry VII. From her and her father, who was a learned scholar, Bulwer claimed to have derived his love for letters. As a boy he lived much among his grandfather's books and read through three circulating libraries. He wrote volumes of Byronic verse, some of which was published at the age of 17. Prepared for the university at various private schools, he entered Trinity College, Cambridge, at Easter in 1822; but soon migrated to Trinity Hall, where it was not necessary to attend lectures. At Cambridge he was a conspicuous member of the Union; he won the Chancellor's medal in 1825, and sketched two novels. At this time he also read enormously in history and began the practice of keeping those huge commonplace books which afterward became useful in preparing his historical novels. Before receiving his bachelor's degree in 1826, he published more Byronic verse, fell desperately in love, made a tour of Scotland and the English lakes, and passed a season in Paris, where he was received into the most brilliant *salons*. Returning to London «a finished dandy,» he married on 29 Aug, 1827, Rosina Doyle Wheeler, a beautiful Irish girl of some accomplishments. The marriage led to an estrangement from his mother and the young man was consequently thrown upon his own resources. He settled with his wife at Woodcot House in Berkshire, where he attempted to live in style from what he could earn with his pen. The marriage proving uncomfortable, a legal separation was obtained in 1836 after years of a life apart. On the death of his mother in 1843 he inherited Knebworth and assumed the surname of Lytton.

To pass by Bulwer's numerous contributions to annuals and periodicals, he published in 1827, ‹Falkland,› a sentimental novel in imitation of Rousseau's ‹Nouvelle Héloise.› After a quick passage through the sentimental stage, he came out with ‹Pelham› in 1828, a brilliant novel founded upon what he had seen of high life in London and Paris. It was likewise Bulwer's first excursion into politics and crime. Late in the same year followed ‹The Disowned,› a curious novel which the author called «metaphysical» inasmuch as the characters are intended to stand for «certain dispositions influential upon conduct.» After ‹Devereux› (1829), an experiment in historical romance, Bulwer took up the criminal novel, publishing ‹Paul Clifford› (1830) and ‹Eugene Aram› (1832), which are among his most characteristic books. By this time a popular novelist, he displayed during the coming years extraordinary versatility. With ‹The Pilgrims of the Rhine› (1834) he began a series of fantastic tales which he called ideal and poetic, announcing that they should be judged «by the rules rather of poetry than prose.» The chapter entitled «The Life of Dreams» elaborates a clever system of dreaming, evidently made use of in our day by Du Maurier in ‹Peter Ibbetson› and by Kipling in ‹The Brushwood Boy.› Occult philosophy was cleverly employed in ‹Zanoni› (1842) and speculation about the future age of electricity in ‹The Coming Race› (1871). A series of ghost stories culminated in ‹The Haunted and the Haunters› (1861) hardly surpassed in its kind. Historical romance, resumed in ‹The Last Days of Pompeii› (1834), was continued in ‹Rienzi› (1835), ‹The Last of the Barons› (1843), ‹Harold› (1848), and the incomplete ‹Pausanias› (posthumous, 1876). The best of these novels stand for an attempt to get near to the facts of history. In the midst of this work was planned a comprehensive history of ‹Athens, its Rise and Fall,› of which two volumes appeared in 1837. Another idealization of the criminal in ‹Lucretia› (1847) provoked considerable criticism, to which he replied with ‹A Word to the Public› (1846). To test his popularity Bulwer now published anonymously in *Blackwood's Magazine* three experiments in 18th century humor. The series comprises ‹The Caxtons› (1849), ‹My Novel› (1853), and ‹What Will He Do

With It’ (1858). Though a little too obviously in the manner of Sterne, the novels are among Bulwer's best work. They were, curiously enough, as well received by the public as if they had borne the author's name. Somewhat like them is ‘Kenelm Chillingly’ (1873), interesting besides for its infusion of autobiography.

Throughout his career, Bulwer never ceased to cultivate his muse. From the Byronic influence that marked his poems down to 1830, he worked into satire, addressing himself “to the humors rather than to the passions of men.” The ‘Siamese Twins’ (1831), a poem of four books in the metre of ‘Hudibras,’ appeared in a volume of miscellaneous poems, of which the longest is one on Milton. ‘The New Timon; A Poetical Romance of London’ (1846), a satire on men then prominent in politics and literature, is memorable for the reference to Tennyson as “Schoolmiss Alfred,” and for Tennyson's caustic stanzas in a reply contributed to *Punch,* 28 Feb. 1846. Among Bulwer's other collections of verse as ‘Poems and Ballads,’ translated from Schiller (1844); an epic in two volumes on ‘King Arthur’ (1848-49); ‘The Lost Tales of Miletus’ (1866); and a translation of the ‘Odes and Epodes of Horace’ (1869). If Bulwer did not gain much fame as a poet, he exactly hit popular taste in three plays — ‘The Lady of Lyons’ (1838), ‘Richelieu’ (1838) and ‘Money’ (1840) — which still keep the stage.

Bulwer's rôle in letters has obscured for later times the part he played in politics. From 1831 to 1841 he sat in Parliament as a Liberal member of Saint Ives, Huntingdonshire and then for Lincoln. After making his maiden speech in support of the Reform Bill, he devoted his energies largely in favor of copyright on original works, cheap postage on newspapers and the laws affecting dramatic literature and the stage. His early speeches on these subjects are still worth reading. In 1834, he issued a spirited pamphlet on the ‘Present Crisis,’ which went through 20 editions and influenced greatly the election that brought Lord Melbourne back to power. The new Premier offered him a lordship in the Admiralty but the post was declined. In 1841, Bulwer lost his seat owing to his willingness to accept a slight tax on corn. Ten years later he advocated protection to this extent in ‘Letters to John Bull, Esq.’; and in 1852 he returned to Parliament as a Conservative member for Hertfordshire. His numerous speeches of this period relate to the excise duties, the Crimean War, China and the East India Company. On the formation of the Derby Ministry in 1848, he became Secretary to the Colonies. While holding this office he organized the new colony of British Columbia. He spoke in support of Disraeli's reform bill of 1859, but against the measures introduced by Lord Russell and Gladstone in 1860 and 1866. As a reward for his services, he was elevated to the peerage in 1866, as Baron Lytton of Knebworth. Before this he received the degree LL.D. from both of the great English universities. In 1854 he was installed honorary president of the Associated Societies of Edinburgh University, and he was twice elected lord rector of the University of Glasgow. To the last he kept up his literary work. ‘The Parisians’ was running in *Blackwood's Magazine* when the end came at Torquay on 18 Jan. 1873. He was buried in Westminster Abbey.

As a novelist Bulwer was subject to fierce assaults from the critics throughout his career. Thackeray, for example, in a review of ‘Ernest Maltravers’ ridiculed and scorned his bad art, affected style, “his eternal whine . . . about the good and the beautiful” and “the dulness of his moral sense.” Still there is the other side. In various prefaces to his novels and especially in two papers contributed to the *Monthly Chronicle* for 1838, Bulwer carefully elaborated his views on the art of fiction, drawing clear distinctions between the novel and the drama as he understood and practised them. He never aimed at the dramatic novel wherein each incident and conversation must contribute to the working out of a logical plot. “It is often desirable,” he said with reference to the novel, “to go back instead of forward,— to wind, to vary, to shift the interest from person to person” that the reader may not become fatigued. In that aim he succeeded. However much his novels may fail in technical details, they have never failed to find an audience.

Bibliography.— Unfortunately there is no adequate life of Bulwer or critical edition of his novels, indicating the many important changes he made in the text from time to time. Uncritical editions of the novels are numerous. To his ‘Speeches’ (2 vols., Edinburgh 1874), his son, the Earl of Lytton, prefixed a memoir dealing with his political career. The period of his life from 1803 to 1832 is covered by a most interesting autobiography, half fact and half fiction, and several supplementary chapters by his son, published together under the title ‘Life, Letters and Literary Remains’ (2 vols., London 1883). After the death of Lady Lytton, her executrix, Louisa Devey, published in vindication of her memory ‘Letters of the Late Edward Bulwer, Lord Lytton to his Wife’ (New York 1889). Consult also Cooper, ‘Life of Edward Bulwer, First Lord Lytton’ (London 1873); Escott, ‘Edward Lytton’ (London 1910); Ten Brink, ‘Edward Lytton’ (Leyden 1882); and Second Earl of Lytton, ‘Life of Edward Bulwer, First Lord Lytton’ (2 vols., New York and London 1913).

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BULWER-LYTTON, Edward Robert. See LYTTON, EDWARD ROBERT BULWER.

BUM-BOAT (perhaps originally “boom-boat,” from the boom rigged out from the side of a man-of-war at anchor, to which boats may make fast), employed by hucksters to visit ships lying at anchor, with supplies of provisions, trinkets, clothing, etc., for sale to the sailors.

BUMBLEBEE, a wild bee of some species of the genus *Bombus,* of which upward of 50 species inhabit North America. Few occur in the southern hemisphere or tropical regions, and none in Africa south of the Sahara or in Australia, while they are the only bees inhabiting Arctic and Alpine regions. The bumble, or humble, bee is recognized by its large, thick, hairy body and long bass hum. The colonies of bumblebees are not numerous compared with those of wasps, or the stingless or the honey bee. A populous colony in England and

America may number from 300 to 400 individuals. The proportion of sexes and castes of *Bombus muscorum* in England were found by Smith to be, in a colony of 120, 25 females, 36 males and 59 workers. The roundish oval cells differ in size and have no exact arrangement. Besides the cells containing the young, the old discarded ones are made to serve as honey tubs or pollen tubs, and there are also the cells of the guest or Psithyrus bees. In good weather and when flowers are plentiful the bees collect and store honey in abundance, and when the empty pupa-cells are full they form special cells made entirely of wax and these are filled with honey, and left open for the benefit of the community (Sharp). Hofer states that special tubs for the storing of pollen are sometimes constructed. Putnam says that the larvæ make their own cells of silk, which are finally strengthened with wax by the old bees. Bumblebees have been seen working in warm moonlight nights. About two centuries ago Godart stated that a trumpeter bee is kept in some nests to rouse the colony to work by three or four o'clock in the morning, and this has been recently confirmed by Hofer, who observed the fact in his laboratory. If the trumpeter was removed its place was filled the next morning.

There is a great deal of variation in our bumblebees, and, besides the local and climatic varieties, polymorphism is apparently marked, as Packard has (in *Bombus fervidus*) detected two sets of males and females, the large and the small; but whether there are two sizes of workers has not yet been ascertained. The queen bees lay their eggs in masses of bee-bread attached to the top or sides of the old cells, in little enclosures formed by thin partitions set up by the bee after the eggs have been deposited. Thus placed, says Packard, in a mass of food, the young larvæ, on hatching, begin, by eating the food, gradually to construct their cells in the manner described by Putnam, who gives the following account of the economy of the bumblebee colony: The queen awakens in early spring from her winter's sleep beneath the leaves or moss, or in deserted nests, and selects a nesting-place, generally in an abandoned nest of a field-mouse, or beneath a stump or sod, and immediately collects a small amount of pollen mixed with honey, and in this deposits from 7 to 14 eggs, gradually adding to the pollen mass until the first brood is hatched. She does not wait, however, for one brood to be hatched before laying the eggs of another; but as soon as food enough has been collected, she lays the eggs for the second. As soon as the larvæ are capable of motion, and commence feeding, they eat the pollen by which they are surrounded, and, gradually separating, push their way in various directions. Eating as they move, and increasing in size quite rapidly, they soon make large cavities in the pollen mass. When they have attained their full size, they spin a silken wall about them, which is strengthened by the old bees covering it with a thin layer of wax, which soon becomes hard and tough, thus forming a cell. The larvæ now gradually attain the pupa stage, and remain inactive until their full development. They then cut their way out, and are ready to assume their duties as workers (small females), males or queens. The cells vary in size and are known as queen, worker and drone cells. Of the first brood only workers are permitted to survive. These now supply the colony with honey and pollen and the queen remains in the nest, laying eggs from which emerge new workers until the colony is strong. About mid-summer males or drones are permitted to develop and in July a number of eggs are laid in the queen cells. The young queens are fertilized by the drones in the fall, the latter dying after the effort. On the approach of cold weather all the workers die, leaving the nest in possession of the queens, who sleep through the winter to awaken in spring, when the process begins anew. See BEE; BEEKEEPING.

BUMBLEFOOT, a corn or abscess on the feet of domestic fowls, thought to arise from roosting on narrow perches or walking on sharp pebbles. The disease is sometimes incurable, but in other cases yields to the daily application of lunar caustic.

BUMMALOTI, a fish (*Harpodon nehereus*), related to the salmon, but marine, which is caught in large quantities on the western coast of India, dried, salted and exported all over the East. A trade-name is "Bombay duck." It is a very long fish, with a long mouth containing slender teeth, an indication of its voracity.

BUMPING POSTS, constructions at the ends of railroad tracks in shifting yards, intended to prevent cars from running off the track. They are usually strong wooden frames with buffers placed at such a height as to receive the blow of the platform or coupler of the car. Banks of earth or cinders are sometimes utilized for this purpose and portable metal posts known as shipblocks are frequently employed as bumping posts.

BUMPO, Natty. See LEATHERSTOCKING TALES.

BUMPUS, Hermon Carey, American educator: b. Buckfield, Me., 5 May 1862. He was graduated from Brown University in 1884, was professor of biology at Olivet College, Michigan, 1886–89; professor of zoology in Clark University, Worcester, Mass., 1890–91; and professor of comparative anatomy in Brown University from 1892. In 1898 he was appointed director of the biological laboratory of the United States Fish Commission at Wood's Hole, Mass., and was assistant to the president and curator of the department of invertebrates in the American Museum of Natural History in New York in 1901–02, when he became director of the Museum. He was chosen business manager of the University of Wisconsin in 1911; chosen president of Tufts College in 1914. He is the author of 'A Laboratory Course in Invertebrate Zoology' (1893); also numerous monographs and articles on biology and educational subjects.

BUNCE, Francis Marvin, American naval officer: b. Hartford, Conn., 25 Dec. 1836; d. there 19 Oct. 1901. He entered the naval service in 1851 and was graduated from the Naval Academy in 1857. In 1862 as executive officer of the *Penobscot* he took part in the engagement with the rebel batteries at Yorktown, Va. Assigned to temporary duty with the army, he had charge of the disembarkation of the heavy artillery and mortars for use in the investment of Yorktown by General McClellan, April 1862. He commanded a successful expedition up Little River, between North and South Carolina, destroying several schooners and large quantities of cotton, turpentine and resin, together with extensive salt works. With the monitor *Patapsco* in 1863 he took part in all the actions in which she was engaged during the siege of Charleston, and was wounded by the premature explosion of a cartridge. Later he was chief of scouts on the staff of Admiral Dahlgren. On 5 Sept. 1865 he was placed in command of the monitor *Monadnock* and took that vessel from Philadelphia to San Francisco, the first extended sea voyage ever made by a monitor. On 1 March 1895 he was selected to command the North Atlantic squadron, with the rank of active rear-admiral. On 1 May 1897 he went to the Brooklyn navy yard and there superintended the conversion of many fast ships and yachts for war service. It is said that the government's policy of furnishing the navy with abundant ammunition for target practice and giving prizes for the best shots, a policy which produced such admirable results in the Spanish-American War, was due to the efforts of Admiral Bunce. He was commissioned rear-admiral 6 Feb. 1898, and retired from active service 25 Dec. 1898.

BUNCE, Oliver Bell, American author: b. New York, 8 Feb. 1828; d. there, 15 May 1890. After spending several years as clerk in a stationery store, and bookseller and publisher on his own account, he became manager of the publishing house of James G. Gregory, which he conducted very successfully for many years. It was at his instigation that the fine edition of Cooper's works, with steel and wood engravings by F. O. C. Darley, was planned and published. For a short time he was a reader for Harper & Bros., but in 1869 he formed a connection with D. Appleton & Company, that ended only with his death. He edited 'Appleton's Journal,' and largely planned and carried through for the firm some of their most famous illustrated publications, such as 'Picturesque America,' 'Picturesque Europe,' 'Picturesque Palestine.' In addition to office business his literary aptitudes and ambitions kept him at work in spite of chronic invalidism. He wrote, among other works, 'Romance of the Revolution' (1852); 'A Bachelor's Story' (1859); 'Life Before Him' (1860); 'Bachelor Bluff, His Opinions, etc.' (1881); 'Don't: A Manual of Mistakes and Improprieties' (1883), of which over 100,000 copies have been sold; 'My House: An Ideal' (1884), a graphic study of a country home; and 'The Adventures of Timias Terrystone: a Novel' (1885). As a very young man he wrote three plays which were accepted and produced on the stage with success: 'Fate, or the Prophecy,' a tragedy; 'Love in '76,' a comedy; 'Marco Bozzaris,' an heroic tragedy. The second of these was played by Laura Keene, the other two by James W. Wallack.

BUNCO, a familiar term applied to the practices of a certain class of swindlers. The trickster trades upon the credulity of the apparently well-to-do stranger in the city, under pretense of some connection with the latter's friends or native place, or by similar expedients. After confidence is secured, counterfeit money is imposed upon him, he is induced to cash «bogus» checks, etc., or even becomes the victim of more direct robbery.

BUNCOMBE, or **BUNKUM**, swollen political oratory not directed to the point in hand or the audience present, but to the achievement of a charlatanic reputation outside. «Twisting the tail of the British lion,» and other like feats of windy chauvinism, are specimens of buncombe; the object of the speaker being, not primarily to impress the hearers, but to make the general populace admire his swaggering patriotism. The reputed origin of the story is an anecdote of a member of the North Carolina legislature, from Buncombe County in that State, who told the thin remnants of a house he had nearly emptied by his dull and pointless remarks, that they might go, too, as he was only «speaking for Buncombe.» Consult Wheeler, 'History of North Carolina.'

BUNDELCUND, bŭn-dĕl-kŭnd', or **BANDALKHAND**, bŭn-dĕl-känd', India, a tract, consisting partly of certain British districts connected with the Northwest Provinces, and partly of a number of small native states subordinate to the central Indian agency. Politically, there are nine states, 13 estates and the pargana of Alampur belonging to the Indore state, making an area of 9,851 square miles. Diamonds are found, especially near Panna. Its surface is considerably diversified, and there are several ranges of hills, some of which reach the height of 2,000 feet. It has soil of every variety, which yields almost every grain and plant of India. The Jumna and the Ken are the only two navigable rivers. The lesser waters are carried by different streams to the Jumna and so on to the Ganges. A branch of the Great Indian Peninsular Railway traverses the north of the country. A garrison of all arms is stationed at Nowgong. Pop. about 1,400,000. The people represent various races, the Bemdelas still remaining chieftains. The prevailing religion is Hinduism. In 1817 the British government, by the Treaty of Poona, acquired all territorial rights over Bundelcund. There was a mutiny in 1857.

BUNDESRATH, boon'dĕz-rät, the German Federal council which represents the individual states of the empire, as the Reichstag represents the German nation. It consists (1916) of 61 members, who are appointed by the governments of the individual states for each session, while the members of the Reichstag are elected by universal suffrage and ballot for the term of five years, and its functions are mainly those of a confirming body, although it has the privilege of rejecting measures passed by the Reichstag.

BUNDESSTAAT, a German term denoting a political form created by the union of several independent states into a single sovereign state with a Federal government. Examples are the United States, Switzerland and Germany.

BUNDI, boon-dē', or **BOONDI**, India, a native state of Hindustan, in the southeast of Rajputana, under British protection; area 2,220 square miles. A double line of hills running from southwest to northeast, penetrated by few passes and rising to the height of 1,793 feet, divides the state into two almost equal portions, that of the south being the more fertile. Much of the state is under wood. The chief river is the Mej, which penetrates the central range and joins the Chambal near the northeast extremity of the state. It was much more extensive before Kotah and its territory were separated from it. The inhabitants are of the Hara tribe, which has given birth to many famous men, and, among others, to Ram Singh Hara, one of Aurungzebe's most renowned generals. The ruler is practically absolute in his own territory. Pop. 218,731. Bundi, the capital, is picturesquely situated on a steep slope in a gorge in the centre of the hills above mentioned, 190 miles southwest of Agra, and its antiquity, numerous temples and magnificent fountains give it a very interesting appearance. It is crowned by a fort and surrounded by fortified walls. For picturesque effect its main street is almost unequaled. At its upper extremity stands the palace, built of stone, with turreted windows and battlements, supported partly by the perpendicular rock, and partly by solid piers of masonry 400 feet high. At its lower extremity is the great temple dedicated to Krishna. Pop. 31,000.

BUNGALOW, an East Indian term for a kind of country house with a thatched or tiled roof. Bungalows are generally of one story, though sometimes of two, and have verandas running round them to afford shelter from the sun. Public bungalows for travelers (daks) are maintained by government on the main highways. In the United States the term means any small cottage of one story usually, or else with a second story in the roof, with dormer windows. It usually has large porches. Consult Saylor, ‹Bungalows: their Design, Construction and Furnishing› (New York 1913).

BUNGAY, England, a market town in Suffolk, on the right bank of the Waveney, 30 miles northeast of Ipswich. It is well built; the streets, spacious and well paved, diverge from a moderate-sized area in the centre of the town forming a market-place, in which is a handsome cross. It has two fine churches. The principal trade is in corn, flour, lime and malt, in which a considerable amount of business is done. There is also an extensive printing office. Adjoining the town is a very spacious common. Pop. 3,359.

BUNGE, boon'gė, **Alexander**, Russian botanist: b. Kiev, 24 Sept. 1803; d. 1890. He was educated at Dorpat, and after taking the degree of M.D. in 1825 he traveled in Siberia and the eastern part of the Altai Mountains, and then joined the mission of the Academy of Saint Petersburg to Pekin, where he remained eight months and procured an extensive herbarium. In 1883, by invitation of the Academy of Saint Petersburg, he made a second Asiatic journey, and in 1836 settled as professor of botany at Dorpat. His principal publications are catalogues of the plants which he collected in China and near the Altai Mountains.

BUNGE, Friedrich Georg von, Russian legal historian (brother of the preceding): b. Kiev, 13 March 1802; d. 1897. He was educated at Dorpat, and for many years was professor of law there. His writings, principally upon the history of law and rights in the countries around the Baltic Sea, are numerous and valuable.

BUNGENER, boon-ge-nā, **Louis-Félix**, French writer and critic: b. Marseilles, 29 Sept. 1814; d. Geneva, June 1874. He was graduated from the theological school in Geneva and afterward continued in the same institution as professor until 1848, when he began to devote his time to literature. His works, most of which were published at Geneva, are quite numerous. Among the most notable of them are ‹Deux Soirées à l'hôtel de Rambouillet› (1839); ‹Essai sur la Poésie moderne› (1840); ‹Histoire du concile de Trente› (1846); ‹Voltaire et son temps› (1850); ‹Julien, ou la fin d'un siècle› (1853, 4 vols.); ‹Rome et la Bible› (1859); ‹Rome et le cœur humain› (1861); ‹Saint Paul, su vie, son œuvre et ses épitres› (1867); ‹Lincoln› (1867). At his death he left a great deal of work still unpublished.

BUNGERT, boon'gărt, **August**, German composer: b. Mülheim, Prussia, 14 March 1846. He studied under Kufferath at Mülheim, at Cologne and Paris. He held a position as musical director at Kreuznach, then went to Berlin, where he continued his studies under Kiel, and later moved to Genoa. By many German musicians he has been regarded as one of the greatest composers of the Wagnerian school. His songs are among the modern masterpieces of that kind of music. His compositions include an opera cycle, ‹The Homeric World,› consisting of two main parts, ‹The Iliad,› and ‹The Odyssey›; ‹Tasso›; ‹The Students of Salamanca,› a comic opera; ‹On the Wartburg,› a symphonic poem; ‹Hohes Lied der Liebe›; a mystery, ‹Warum? Woher? Wohim?›; ‹Heroische Symphonie›; incidental music to Goethe's ‹Faust›; ‹Meerlieder,› and ‹Lieder eiwer Königin›; and a number of songs. The songs are considered his most successful productions.

BUNHILL-FIELDS, formerly **BONHILL FIELD**, a burial-ground in London, near Finsbury square. The poet Southey named it the «Campo Santo of the Dissenters.» Opened in 1665, it became a public «open space» by act of Parliament in 1867. Among those who lie buried there are John Bunyan (1688); Dr. Thomas Goodwin, who attended Cromwell on his deathbed (1679); George Fox, the Quaker (1690); Dr. Isaac Watts (1748); General Fleetwood, son-in-law of Cromwell (1692); Daniel Defoe, author of ‹Robinson Crusoe› (1731); Dr. John Owen, who preached the first sermon before Parliament after the execution of Charles I; William Blake, the painter and poet; Susannah Wesley, mother of John Wesley, and Horne Tooke. In 1870 a monument to Defoe was inaugurated, subscribed for by boys and girls.

BUNIAS, a small genus of plants of the natural order *Cruciferæ*, mostly natives of southeastern Europe and adjacent Asia. Some of the species, especially *B. orientalis*, called hill-mustard, have been cultivated for forage and have become weeds where they have escaped from cultivation. Since they are not very leafy and are not relished by stock, they have not become popular. In Russia it is used as a vegetable.

BUNION, a small, hard, painful tumor formed in any part of the foot, but especially in the metatarsal joints. It consists in a swelling of the bones themselves, which fact distinguishes bunions from corns. It appears to be caused by the pressure of a boot or shoe which is foo tight, especially when the feet are a little deformed. The best means to relieve the pain is to remove the causes of the tumor as soon as possible, to give rest to the foot and to apply lotions and emollient poultices.

BUNKER HILL, Mass., an eminence, 110 feet high, in the Charlestown district of Boston, connected by a ridge with another elevation, 75 feet high, named Breed's Hill. These heights are memorable as being the scene of a battle, 17 June 1775, commonly known as the battle of Bunker Hill. The city of Boston was occupied, by the British under General Gage, who had resolved to begin offensive operations against the rebels. This design becoming known in the American camp, it was determined to seize and fortify the heights of Charlestown on the night of 16 June. The execution of this perilous mission was confided to Colonels Prescott and Pepperell at the head of a brigade of 1,000 men; and at dawn of day a strong redoubt was already completed on Breed's Hill. About 1,500 Americans advanced successively to the relief of Prescott, and General Warren entered the redoubt as a volunteer, refusing the command which was tendered to him. At about 2:30 o'clock, two columns of the British advanced to a simultaneous assault; they were received with a terrific fire, and were twice repulsed in disorder. When the Americans had exhausted all their ammunition, Prescott gave the order for retreat. They received a destructive volley as they left the redoubt, and Warren fell, shot through the head with a bullet. The retreat was harassed by a raking fire from the British ships and batteries, but there was no pursuit beyond Charlestown Neck. The British loss was 226 officers and men killed and 828 wounded; that of the Americans 145 killed or missing and 304 wounded. Although defeated, the moral result of this action was great. The Americans had seen superior numbers of the disciplined soldiers of England retreat before their fire, and had given the proof they they were able to defend their liberties. On Breed's Hill, and near the spot where Warren fell, stands the Bunker Hill Monument, the corner-stone of which was laid by the Marquis de Lafayette, 17 June 1825. This monument was inaugurated 17 June 1843. It consists of a plain granite shaft, 220 feet high, 31 feet square at the base and 15 at the top. The monument affords a magnificent panoramic view of the surrounding country. Consult Ellis, G. E., 'History of the Battle of Bunker's (Breed's) Hill' (1875); Adams, C. F., Jr., in *American Historical Review* (Vol. 1); Frothingham, P., 'Siege of Boston' (Boston 1902).

BUNKER HILL ORATIONS. The first of the so-called 'Bunker Hill Orations' of Daniel Webster was pronounced 17 June 1825, the 50th anniversary of the Battle of Bunker Hill, when the cornerstone of the Bunker Hill Monument was laid. The second was delivered 18 years later at the exercises to commemorate the completion of the monument. The earlier address is, justly, the better known, and ranks as one of the most notable examples of American oratory, if indeed it is not the greatest occasional oration delivered in America during the first half of the last century. Though Webster substituted a weighty dignity of utterances and sheer personal force for the more exuberant figures, the classical allusions and quotations which were in vogue in the public speaking of his day, he belonged after all to the old school, which regarded oratory as something apart from the simple expression of natural thought and feeling. A comparison of the 'First Bunker Hill Oration' with Lincoln's 'Gettysburg Address' will make this plain; and it may help in explaining why, notwithstanding the clearer recognition of Webster's honesty and ability, his orations are less read and admired now than they were in his day. The most valuable part of the 'First Bunker Hill Oration' is the discussion of the American government and the ideals for which the fathers fought — a feeling exposition which seems to have renewed pertinency in each new national crisis; but the most popular passage is perhaps the moving address to the veteran survivors of the battle, who were seated on the platform. The second oration is filled with felicitations and compliments, and contains no very notable passage, though the tribute to Washington has often been quoted.

William B. Cairns.

BUNODONT, a term applied to animals in which the crowns of the molar teeth are composed of a number of low rounded cones or cusps. The pig is one of the best examples among living animals; the teeth of monkeys and other omnivorous or frugivorous animals, including man, are also of this type. It is probable that the molars of many if not all modern mammals have been evolved from bunodont teeth, for the ancestors of many races of the modern hoofed animals, carnivora, and some other groups, show a series of stages in the evolution of the teeth leading from the omnivorous bunodont type into the specialized grinding or cutting teeth (selenodont) of the modern animals. See Teeth.

BUNSEN, Christian Karl Josias (Chevalier), German statesman and philosopher: b. Korbach, Waldeck, 25 Aug. 1791; d. Bonn, 28 Nov. 1860. He studied philology under Heyne at Göttingen, and subsequently went to Holland and Denmark, to acquire a critical knowledge of the Danish and Dutch languages. In 1815 he made the acquaintance at Berlin of the celebrated Niebuhr, and in 1816 proceeded to Paris, where he studied Persian and Arabic under Sylvestre de Sacy. The same year he visited Rome, where he married, and renewed his intimacy with Niebuhr, then Prussian Ambassador to the Papal court. Niebuhr procured him the appointment of secretary to the Prussian legation, and in 1823 Bunsen assumed Niebuhr's duties, being later, and in 1827, formally accredited as resident Prussian Minister. In this capacity he continued till 1838, and conducted several important negotiations with the Papal see, the result of one of which was the brief of Leo XII relative to mixed marriages. His next mission was to Berne, as Ambassador to the Swiss Federation. During his residence at Rome Bunsen had industriously pursued his philosophical and historical studies, including more especially that of the Platonic philosophy, and investigations into the religious and ecclesiastical history of mankind. The liturgies of the Church received his especial attention, and a service of his own framing, introduced by him into the chapel of the Prussian embassy at Rome, was printed by order of the King of Prussia, who wrote a preface to it. This work was published without the author's name at Hamburg in 1846, under the title of 'Allgemeines Evang. Gesang-und Gebetbuch' ('General Hymn and Prayer Book of the Evangelical Lutheran Church'), and may be regarded as a new edition of the 'Versuch Eines Allgemeinen Evang. Gesang-und Gebetbuchs,' published at Hamburg in 1833.

In 1841 Bunsen was summoned to Berlin from Switzerland to proceed to England in charge of a mission for the establishment, in conjunction with that country, of a bishopric at Jerusalem. Shortly afterward he was nominated Prussian Ambassador to England. In 1844 he was consulted on the subject of granting a constitution to Prussia, and is said to have drawn up and submitted to government the form of one which bore a very close resemblance to that of Great Britain. In the Schleswig-Holstein affair he strenuously opposed the claims of Prussia and the German Confederation in opposition to those of Denmark. From the opposite views taken by him to those of his government in relation to the Russian War he was recalled from London in 1854, and, abandoning politics, retired to Heidelberg to devote himself exclusively to literary pursuits. The results of these have established his reputation as one of the most profound and original critics in the department of Biblical and ecclesiastical history. Among these are 'Die Verfassung der Kirche der Zukunft' ('The Constitution of the Church of the Future') (1845); 'Ægyptens Stelle in der Weltgeschichte' ('Egypt's Place in the World's History') (1845); 'Hippolytus und Seine Zeit' ('Hippolytus and His Time') (1851), and lastly, his greatest work, 'Bibelwerk für die Gemeinde' ('Bible Commentary for the Community'), the first part of which was published in 1858, and was intended to be completed in 1862. It had occupied his attention for nearly 30 years, and, as he informs us, was regarded as the grand centre-point to which all his literary and intellectual energies were to be devoted. Death interposed to prevent him completing his undertaking. Ill health caused him to spend the winters of 1858–59 and 1859–60 at Cannes, in the south of France, returning thence in the spring of 1860 to Bonn (whither he had recently transferred his abode from Heidelberg), where he died. Three volumes of his 'Bibelwerk' had been published at his death (the first, second and fifth), and this great work was completed in his spirit and by the aid of his manuscripts under the editorship of Holtzmann and Kamphausen, in nine volumes (1858–70).

BUNSEN, Robert Wilhelm Eberard, German chemist: b. Göttingen, 31 March 1811; d. 16 Aug. 1899. He studied at Göttingen University and at Paris, Berlin and Vienna; was appointed professor at the Polytechnic Institute of Cassel 1836; extraordinary professor at the University of Marlburg 1838, and ordinary professor there 1841; professor at Breslau 1851; and finally professor of experimental chemistry at Heidelberg 1852. Among his many discoveries and inventions are the production of magnesium in quantities, magnesium light, spectrum analysis, and the electric pile and the burner which bears his name (see below). Among his works are 'Chemische Analyse durch Spektralbeobachteungen' (with Kircholl, 1861; new ed., 1895); 'Gasometrische Methoden' (1857; English by Roscoe); and 'Anleitung zur Analyse der Aschen und Mineralwasser' (1874). He retired from active teaching in 1889.

BUNSEN BATTERY, a modification of the Grove battery, plates or bars of gas coke being used instead of platinum. The electromotive force is slightly less than that of the Grove battery.

BUNSEN BURNER, a form of gas-burner especially adapted for heating, consisting of a tube in which, by means of holes in the side, the gas becomes mixed with air before consumption, so that it gives a non-illuminating, smokeless flame. Burners of this nature are part of the indispensable outfit of a chemical laboratory.

BUNT, sometimes called **SMUT BALL, PEPPER BRAND** and **BRAND BLADDERS,** the most formidable disease, perhaps, to which wheat is subject, but one which may in most instances be greatly modified, and which seldom in the present day does material injury except where there is careless cultivation. Like many other of the diseases to which the cereal plants are subject, it arises from the attack of a parasitic fungus (*Uredo caries*). It is generated in the ovary of wheat and a few other *Gramineæ,* and very rarely on the stem. It is formed at an early stage of growth, before the ear is free from the sheath; and indeed the plants which are affected by the parasite may be readily recognized by their unusual luxuriance, being generally several inches higher than plants not affected, larger in bulk, and often producing a greater number of stems from the same root. The bunted grains are shorter and blunter than the sound, of a dark-green when young, but when old of a pale brown, or sometimes nearly black. The contents of the ovary are reduced to a uniform black powder or paste, which has an offensive smell like that of decayed fish. Various substances have been used by cultivators to prevent the growth of bunt, such as salt, quicklime, arsenic, corrosive sublimate, etc. Careful washing and a selection of good seed will alone prevent much mischief, but it is advisable to take some more stringent measures with a view to destroy the vitality of the bunt spores. For this purpose Dombasle's method is the most successful. It consists in thoroughly wetting the grain with a solution of sulphate of soda (Glauber's salts), then drying the wheat with quicklime, which combines with the water to make sulphate of lime (gypsum), which acts as a manure, while the caustic soda destroys the vegetative powers of the bunt spores.

BUNTER SANDSTONE, one of the three divisions of the Triassic. It is the lowest, that is, the oldest of the series. It corresponds to the *grès bigarré* (variegated freestone or grit) of the French. In the Hartz it is more than 1,000 feet thick; in Cheshire and Lancashire, England, about 600. It consists chiefly of red sandstones, and fossils are very rare. The rocks are highly porous and afford an important source of water supply. The footprints formerly known as those of chirotherium, now known to be labyrinthodont, are found in the bunter; the plants are chiefly ferns, cycads and conifers.

BUNTING, Jabez, English clergyman: b. Monyash, Derbyshire, 1778; d. London, 16 June 1858. His parents were members of the Wesleyan Church and removed to Manchester when he was a child. While at school he attracted the attention of Dr. Percival, who employed him as his amanuensis, and at his death made him one of his executors. He early joined the Church; became a traveling preacher in 1799; joined the Conference after the death of Mr. Wesley, and was appointed to the Oldham circuit. After traveling four years he was sent to London, where he gained great popularity as a pulpit and platform orator. After remaining two years in London he was removed to Manchester, where he distinguished himself as an advocate of ecclesiastical order and discipline in a controversy with some disaffected Methodists. In this controversy he gave such evidence of a knowledge of the polity of Wesleyan Methodism as secured for him the favor of the entire body to which he belonged. He was four times president of the Methodist Conference; 17 years missionary secretary, and three years as editor. In 1835 he was chosen president of the theological school, and was looked upon as the acknowledged leader of the Methodists, superintending the interests of the body at home and abroad, while, at the same time, his influence was felt in other evangelical denominations, and also in the political world, statesmen frequently resorting to him for advice. Yet he derived only the ordinary emoluments of a Methodist minister — a yearly salary of £150, with house-rent and taxes. During all the distractions connected with the secessions that have taken place in the Wesleyan body, Dr. Bunting remained a firm, unwavering adherent and advocate of the doctrines and discipline of the Church as they came from the hands of John Wesley, and to his influence and indefatigable zeal are largely to be ascribed the permanency and prosperity of the Wesleyan connection.

BUNTING, Sir Percy (William), English journalist: b. Manchester 1836; d. 22 July 1911. He was educated at Owens College, Manchester, and Pembroke College, Cambridge, and was called to the bar. He was editor of the *Contemporary Review* from 1882 until his death and was concurrently editor of the *Methodist Times* from 1902. He was knighted in 1908.

BUNTING, William Maclardie, Wesleyan minister: b. Manchester, 23 Nov. 1805; d. Highgate Rise, 13 Nov. 1866. He began to preach at the age of 18. For many years he was very active in the Evangelical Alliance and also in the British Society for the Propagation of the Gospel among the Jews. After his death his selected sermons and other writings were published, under the editorship of G. Stringer Rowe (1870).

BUNTING, one of a group of cone-billed birds, forming the genus *Emberizidæ,* represented in Europe by several large, brown-streaked, or yellowish finches, of which the corn-bunting, reed-bunting and cirl-bunting are well known in Great Britain. It is marked by its cone-shaped bill and a hard knob on the inner surface of the upper mandible. The corn-bunting, which is considerably larger than a house sparrow, is brown in color with darker streaks on the upper parts or whitish brown with dark brown spots and lines on the under parts, and has a slightly forked tail. The reed-bunting has a black head and throat and the nape and sides of the neck are white. The head of the cirl-bunting is olive-green, with bright yellow patches on the cheek and over the eyes. The term is used in the United States for two or three similar birds, such as the dick-cissel and snow-bunting (qq.v.). All the buntings are good singers, and the term is applied by dealers in cage birds not only to the true European buntings, but to many other seed-eaters, such as the ortolan and our indigo-bird.

BUNTING, a thin woolen stuff, of which flags are usually made; hence, flags, collectively.

BUNYA-BUNYA, the native Australian name of *Araucaria bidwillii,* a fine Queensland tree with cones larger than a man's head, containing seeds that are eagerly eaten by the natives.

BUNYAN, John, English preacher and author: b. Elstow, near Bedford, Bedfordshire, England, 1628; d. Swan Hill, London, 31 Aug. 1688. The Bunyans were an old family in Bedfordshire but Bunyan's immediate ancestors for several generations had been obscure, and Bunyan's own father, Thomas Bunyan, was a tinker. Of his mother, Margaret Bentley, little is known. In spite of their lowliness, however, these parents trained Bunyan with some care and sent him to the Bedford schools. Then he took up the trade of tinker, at which, until he became an established preacher, he worked industriously. In the latter part of 1645 and the early months of the following year he fought in the Civil War, but on which side is uncertain. Froude maintains that he was in the Royalist army, whereas Macaulay and Brown, to whom the weight of authority must be given, state that the evidence goes to show that Bunyan was with the Parliamentarians. In 1646, he returned to his trade in Elstow, and at about the age of 20 married a wife, whose goodness of character is the accepted proof that Bunyan was better than he represented himself.

Of far more importance in giving character to Bunyan's career was his spiritual life. Besides being brought up religiously and at a time of peculiarly strong belief in the literal truth of hell and heaven, of damnation and atonement, of devils and evil spirits, Bunyan's boyhood and early manhood were not only a continual struggle between the inclinations of an active, pleasure-loving youth and the terror lest he be doomed to eternal perdition, but also a spiritual anguish heightened by one of the most imaginative of minds of which there is record. «He was,» says William James ('The Varieties of Religious Experience'), «a typical case of the psychopathic temperament, sensitive of conscience to a diseased degree, beset by doubts, fears and insistent ideas, and a victim of verbal automatisms, both motor and sensory. These were usually texts of Scripture which, sometimes damnatory and sometimes favorable, would come in a half-hallucinatory form as if they were voices, and fasten on his mind and buffet it between them like a shuttlecock.» Though in most ways a wholly respectable character, he speaks of himself, in his autobiography, ‘Grace Abounding,’ as a most blasphemous youth, in return for which he was warned and tormented by visions to which he gave little heed. When the visions left him he tells us that he became worse, nor were some narrow escapes from death sufficient to make him repent. His marriage had a good effect on him; he went to church regularly and was reverent, though, he says, in a formal way. He still liked his sports and was in the habit of playing cat on the village green Sunday afternoons. The effect of a peculiarly vivid vision of a warning voice from heaven while he was in the act of striking the cat was to make him despair of ever being redeemed from his wicked courses. Yet he began to mend his ways, first giving up his profanity, then his love of bell-ringing, and lastly his dancing, though it took him «nearly a full year before he could quite leave that.» He became esteemed as a godly man, but he feared that he had no depth of repentance. Overhearing some poor old women talking of the new birth and of the ways of resisting the devil, he became convinced that he «wanted the true tokens of a truly godly man.» Though he meditated much on their sayings, though he gave up all his evil companions and once or twice had visions of the way to salvation, two questions obtruded themselves, «Whether he was elected?» and «How if the day of grace should now be past and gone?» After much questioning, distress of mind and manifold temptations that Satan put in his way, he gained some comfort from the Scriptures. The preaching and talk of Gifford, the Bedford minister, made him feel worse and worse; he seemed to himself to be utterly base and corrupt. Temporary comfort came in the Song of Solomon, but about «a month after, a very great storm came down upon me, which handled me twenty times worst than all I had met with before.» Satan was continually with him; he feared that he had blasphemed against the Holy Ghost. This temptation lasted about a year, but partly from texts in the Bible, and partly from the ministrations of Gifford and Luther's ‘Comment on the Galatians,’ he received some comfort. Even so, he was subject to another temptation, which endured a year, «to sell and part with the most blessed Christ.» He feared that he had committed the unpardonable sin, and he was so torn between despair and hope that, after another conflict of three-quarters of a year, he fell into sickness. Even then he was tempted, but his mind and body grew whole together, and from this time on, about 1655, he seems to have felt himself redeemed.

In 1653 Bunyan joined the Bedford church, and two years later, «after I had been about five or six years awakened,» he began preaching at the suggestion of «some of the most able of the saints.» He was at first appalled by the gravity of his mission, but finding that he gave comfort to many he grew more confident. The secret of his success lay in the fact that «I preached what I felt, what I smartingly did feel; even that under which my poor soul did groan and tremble to astonishment.» So great was the sincerity and success of his mission that he raised for himself much opposition among the Anglican divines, and was much slandered. Almost simultaneously, he began his very prolific career as author with a book of controversy directed against the Quakers, ‘Some Gospel Truths Opened’ (1656).

On 12 Nov. 1660, shortly after the return of Charles II, Bunyan was arrested for preaching. Refusing to flee or to agree not to preach, he was lodged in the Bedford county jail. Failing to get his case heard, he remained here for 12 years, except for a few weeks of liberty in 1666. During his unjust imprisonment, Bunyan had some access to the outside world, frequently visiting his church and once going as far as London. In the sense that he had much leisure to write, his confinement was of advantage to him. He composed and had published many books of which the most famous was ‘Grace Abounding to the Chief of Sinners’ (1666). On his release, in 1672, from jail, in accordance with the Declaration of Indulgence of Charles II, he became minister of the Bedford church. In 1675–76, Bunyan was again imprisoned, this time for six months in the small jail on Bedford bridge. The fact is important because it is probable that there he wrote, among other books, at least two-thirds of the first part of ‘Pilgrim's Progress.’ This part was first published in 1678, and a second edition with some additions, as the character of Mr. Worldly Wiseman, appeared the same year. The third came out early in 1679 and since then editions have been numberless. The second part appeared in January 1685. In the interval between the two were published the other books for which Bunyan is best known next to ‘Pilgrim's Progress’ and ‘Grace Abounding’— ‘The Life and Death of Mr. Badman’ (1680) and ‘The Holy War’ (1682). Aside from the imprisonment of 1685 and some persecution Bunyan's last years were quiet. His influence from his preaching and his writing was very widely diffused, and he was, in these respects, second to scarcely any man in England. He met his death in doing a characteristic act of charity: having successfully reconciled a father and son at Reading, he was, while continuing his journey to London, overtaken by a rain storm and died from the effects of the exposure, in his 60th year.

Bunyan ranks among the most popular of English authors: his ‘Pilgrim's Progress’ is said to be read more widely than any other book in the language, except the Bible. It has been translated into over 70 foreign tongues. The reasons for its extraordinary vogue lie in the simplicity of the style, the fervor of the imagination, the universality of its spiritual appeal; no book is more widely intelligible or freer from sectarian dogmas. In all his books he appears as an unsurpassed master of a simple, direct, vernacular style. See HOLY WAR, THE; PILGRIMS'S PROGRESS.

Bibliography.— Editions of Bunyan's four more important works are numerous, and there are several of his collected works. Altogether he wrote about 60 books. Among the many lives that of the Rev. John Brown, ‘John Bunyan, His Life, Times and Work' (1885), is the most complete and authoritative. Froude's life in the 'English Men of Letters' (1880); and that by Canon Venables in the 'Great Writers Series' are also good; to the latter a full bibliography is added. Consult also Dowden, 'Puritan. and Anglican Studies' (1901) and James op. cit. (1902).

BUNZLAU, boontz'low, Germany, the name of several European towns, chief of which are:

1. A town of Prussia, in the province of Silesia, near the Bober, 25 miles west of Liegnitz. Formerly surrounded by fortifications, handsome promenades now cover their sites. In the market-place is an iron obelisk to the Russian general, Kutusov, who died here in 1819. Earthenware, glass, iron, etc., are manufactured. Pop. 16,000.

2. Jung Bunzlau, a town of Bohemia, 31 miles northeast of Prague, the capital of the circle of Bunzlau. It stands on the left bank of the Iser, is well built, and has an old castle, an old and a new town house and other interesting buildings. Its inhabitants are chiefly engaged in manufacturing cottons, woolens, starch, sugar, spirits, beer, etc. Pop. 11,500.

3. Alt Bunzlau, a small town of Bohemia, situated on the Elbe.

BUOL-SCHAUENSTEIN, bwäl-show'en-stīn, **Karl Ferdinand** (Count), Austrian statesman: b. 17 May 1797; d. Vienna, 28 Oct. 1865. He was Minister in succession at Carlsruhe, Stuttgart, Turin and Saint Petersburg. He was second Austrian plenipotentiary at the Dresden Conference (1850), after which he was Minister at London until the death of Schwarzenberg recalled him to Vienna to hold the portfolio of foreign affairs. He presided at the Vienna Conference in 1855, and represented Austria at the Congress of Paris.

BUONAPARTE. See Bonaparte.

BUONAROTTI, bwō-när-rŏt'tē, **Filippo**: b. Pisa, 11 Nov. 1761; d. Paris, 15 Sept. 1837. He received an excellent education under the auspices of the Grand Duke Leopold, but forfeiting the friendship of that prince on account of his sympathies with the French revolutionists, he resorted to Corsica, where he commenced a journal of so inflammatory a character that he became involved in difficulties with the government. After having spent some time in Sardinia, where he was invited to draw up a liberal constitution for the people, he went to Paris to urge the desire of the people of the Corsican island of Saint Pierre for annexation to France. French citizenship was conferred upon him; he was employed in important missions in Corsica and Oneglia and became an ardent partisan of the Terrorists. Having been detained for some time in prison after the fall of Robespierre, he founded the Pantheon Association and when this was dissolved by the government he joined the conspiracy of Babeuf and was sentenced to transportation, but was finally permitted to retire to Geneva, and afterward went to Brussels, where, in 1828, he published his 'Conspiration de Babeuf.' Returning to Paris after the revolution of 1830, he spent the rest of his life in poverty and obscurity.

BUONARROTI, Michelangelo. See Michelangelo.

BUONONCINI, bwō-nŏn-chē'nē, **Giovanni Battista**, Italian composer: b. Modena 1672. In 1697 he went to Vienna and soon after to Berlin, where his opera 'Polifemo' had great success. After living a while at Rome, he went, in 1720, to London, and became there one of the most powerful rivals of Handel. Everything in England at that time was made to bear upon party politics, and Buononcini became the favorite of the Whigs, while Handel was supported by the Tories. But upon a trial of skill, in an opera of their joint composition, the talent and taste of Buononcini proved an unequal match for the genius of his rival.

BUONTALENTI, bwŏn-tă-lĕn'tē, **Bernardo** (Delle Girandole), Italian painter, sculptor and architect: b. Florence 1536; d. 6 June 1608. When 11 years of age an inundation of the Arno broke into the quarter of Florence where his family resided, and carried off every member of it except himself. Cosmo de Medici, on learning the disaster, received him into his palace, and improved the taste which he had displayed for drawing by placing him in the schools of Salviati, Bronzino and Vasari. He displayed great versatility of mind, and excelled not only in the kindred arts of painting, sculpture and architecture, but distinguished himself as a mathematician, a military engineer and an inventor of machines.

BUOY, boo'ĭ, boi or bwoi, any floating body employed to point out the particular situation of anything under water, as of a ship's anchor, a shoal, etc. They are of various shapes and constructions. The can buoy is of a conical form and is used for pointing out shoals, sandbanks, etc. In the United States it is prescribed by law that channel buoys be painted red on the starboard hand coming in from sea, and black on the port or left-hand side. They are also numbered in order from seaward, with even numbers on the starboard and odd numbers on the port hand. Mid-channel obstructions are marked with danger buoys, having black and red transverse stripes. Mid-channel buoys marking the fair way have longitudinal white and black stripes. Buoys marking sunken wrecks are painted green. White buoys designate anchorage limits or dumping limits. A yellow buoy designates a quarantine station. The cask buoy is in the form of a cask; the larger are employed for mooring, and are called mooring buoys. Spar buoys are wooden poles weighted at the thick end, by which they are moored. They are used in inland waters and in situations where, by reason of ice, iron buoys would be damaged in winter. Whistling buoys are provided with apparatus, operated by the waves, which compresses air and discharges it through a whistle. A bell buoy is a large fixed buoy to which is attached a bell which is sounded by the heaving of the sea, serving as a signal in foggy weather. The life or safety buoy is intended to keep a person afloat till he can be taken from the water. Its most usual form is a ring of cork covered with painted canvas and having beckets at its circumference. Life buoys are sometimes equipped with a portfire or signal light which is kindled by pulling a lanyard at the moment of heaving overboard. Gas buoys are charged with compressed gas and provided with a suitable burner. The gas being lighted, and burning continuously, such buoys serve as a guide at night. Some buoys are fitted for generating and burning acetylene gas, and are often made to carry a charge to last six months or more. Electric buoys are illuminated by connection with power on shore by means of a cable.

BUPALUS, Greek sculptor: fl. at Chios about 500 B.C. He and his brother Athenis are best known for their satirical conflict with the poet Hipponax. Augustus adorned many of the Roman temples with works of the two brothers, who used the pure white marble of Paros. Pausanias represents Bupalus as being an elegant architect as well as a sculptor.

BUPHAGA, bū-fą'gą, a genus of birds of the starling family (*Sturnidæ*), whose species are found in various parts of Africa, where they are of great use from their habit of feeding on the parasites infesting cattle. They are popularly known as beef-eaters or ox-peckers, and are distinguished from the true starlings by a stouter beak, bare nostrils, more curved claws and some other characters. The South African ox-pecker (*B. africana*) inhabits Natal, while farther north the genus is represented by a red-billed species (*B. erythrorhyncha*). A third species is found still farther north and also in the Transvaal.

BUPHAGUS, in ancient mythology, a son of Japetus and Thornax, who was killed by Diana for an attempt upon her chastity. A river of Arcadia was named after him. Buphagus was also one of the surnames of Hercules, which was given to him on account of his gluttony.

BUPHONIA, bū-fō'nyą (Gr. βουφόνια ox-killer), an ancient Athenian festival in honor of Zeus, celebrated every year on the 14th of Scirophorion, on the Acropolis. Barley and wheat were placed on the altar, and the ox destined for the sacrifice was permitted to go and eat the grain, when a priest armed with an axe sprang forward and slew the ox, and then secreted himself. The other priests, as if not knowing the author of the deed, made inquiry, and, failing to ascertain anything, for lack of a better victim arraigned the axe, found it guilty and condemned it. The Buphonia were also called Diipolia.

BUPRASIUM, a town of ancient Greece, in Elis, often mentioned by Homer as one of the chief cities of the Epians. It had ceased to exist in the time of Strabo, but the name was still attached to a district situated on the left bank of the Larissus, and on the road leading from Dyme to Elis. The region is now identified with the plain of Bakouma.

BUPRESTIDÆ, bu-prĕs'tĭ-dē, a family of coleopterous insects (bettles), many of which are remarkable for the splendor of their appearance. This family is included in the pentamerous section of *Coleoptera,* which was formed by Latreille, and so named because the members of it have five joints in the tarsi. The characteristics of the *Buprestidæ* are: body ovate, elongated, somewhat broad and obtuse in front, but pointed behind; eyes oval, with the antennæ finely serrate inserted between them; jaws powerful. The larvæ are mostly wood-borers although some of the smaller species mine in leaves or galls. They walk slowly, but fly with great rapidity, especially in warm weather. They are very fond of sunning themselves on bushes or the branches of trees. When one attempts to seize them, sometimes even when one approaches them, they allow themselves to fall suddenly to the earth, or fly rapidly away. There are several hundred species belonging to this family, over 200 species occurring in North America, and the tropical species are those which are chiefly distinguished by the brilliancy of their colors. The prevailing color appears to be green, but species are often found of a blue, red, golden or other color. The most injurious is the *Chrysobothris fermorata,* an apple borer. The largest are the *B. Chalcophora,* which bore into pines. The *B. gigas* of Linnæus, which is about two inches in length, and one of the largest of the family, has bright golden elytra, or wing-cases, which are often used as ornaments by the inhabitants of South America, of which continent it is a native.

BUR-MARIGOLD, a large genus of annual and perennial herbs (*Bidens*) of the family *Asteraceæ,* mostly natives of North America, but widely distributed in other countries, chiefly as weeds, but some as garden plants. The best-known ornamental species is *B. grandiflora,* a native of Mexico. Several species are common in eastern North America, where they are variously known as devil's bootjack, stick-tight, beggar-tick, Spanish-needle, etc. They are especially troublesome in wool and on clothing, to which the seeds stick like burs. Some species are valuable as honey plants.

BURA, in ancient mythology, a daughter of Jupiter, or, according to some authorities, the offspring of Ion and Helice, from whom Bura, or Buris, once a flourishing city of ancient Greece, on the Bay of Corinth, received its name.

BURA, in ancient Greece, one of the 12 original Achæan cities, which stood formerly close to the sea, on the Bay of Corinth, but, having been destroyed, with the neighboring town of Helice, by a terrible earthquake, the surviving inhabitants rebuilt it afterward about 40 stadia from the coast, and near the small river Buraicus. Bura was situated on a hill, and contained temples of Ceres, Venus, Bacchus and Lucina, the statues of which were sculptured by Euclidas of Athens. On the banks of the river Buraicus was a cave consecrated to Hercules, and an oracle usually consulted by the throwing of dice. The ruins of Bura are close to the road from Megastelia to Vostitza, and the cave of Hercules Buraicus is visited by tourists.

BURBANK, Luther, American naturalist, author and plant originator: b. Lancaster, Worcester County, Mass., 7 March 1849; of English-Scotch ancestry; educated in the common schools and local academy; worked as a boy for the Ames Plow Company, agricultural implement manufacturers, Worcester, Mass., where he exhibited marked inventive abilities, but soon began market-gardening and seed-raising in a small way, developing the well-known Burbank potato in 1873; removed to Santa Rosa, Cal., 1 Oct. 1875, where he has since resided and carried on his work. His many and important «new creations» of fruits, flowers, vegetables, timber trees, grains and grasses have made him the best known plant-originator in the world. The characteristics which are the special factors in the success of his work are, the large extent of his experiments, his keenness of perception of slight variations in plant qualities and the rapidity with which he develops new qualities, this rapidity being due to a combination of multiple hybridizing, selection and grafting of seedling plants on mature stocks, so that immediate results as to flowers and fruits are obtained from seedling stems. But the final and most important factor in Burbank's success is the inherent personal genius of the man, whose innate sympathy with nature, aided by the practical education in plant biology derived from 50 years of constant study and experiment, enable him to perceive correlations and outcomes of plant growth which seem to have been visible to no other man. As the history of Burbank's life is the history of his work, the remainder of his biographical sketch may advantageously be devoted to a brief consideration of the character and method of creation of some of his principal new plant varieties. Burbank has originated and introduced a remarkable series of plums and prunes. No less than 60 varieties are included in his list of offerings, and some of them, notably the Gold, Wickson, Apple, October, Chalco, America, Climax, Formosa, Bartlett, Santa Rosa and Beauty plums and the Splendor, Sugar, Giant and Standard prunes are among the best known and most successful kinds now grown. He has also perfected a stoneless prune, the Abundance, and has created an absolutely new species, the plumcot, by a combination of the common plum and the apricot. The Sugar and Standard prunes promise to supplant the French prune in California. The Bartlett plum, cross of the bitter Chinese simoni and the Delaware, a Burbank hybrid, has the exact fragrance and flavor of the Bartlett pear. The Climax is a cross of the simoni and the Japanese triflora. The Chinese simoni produces almost no pollen, but few grains of it ever having been obtained, but these few grains have enabled Burbank to revolutionize the whole plum shipping industry. Most of Burbank's plums and prunes are the result of multiple crossings, in which the Japanese varieties have played an important part. Hundreds of thousands of seedlings have been grown and carefully worked over in his 40 years' experiments with plums and single trees have been made to carry as many as 600 varying seedling grafts.

Burbank has originated and introduced the Van Deman, Santa Rosa, Alpha, Pineapple, «No. 80,» Dazzle and other quinces; the Leader, Opulent and National peaches, cross-bred from the Muir, Wager and White nectarine; the Winterstein and Goldridge apples; and has made interesting, although not profitable, crosses of the peach and almond, and plum and almond.

Next in extent, probably, to his work with plums is his long and successful experimentation with berries. This work has extended through 35 years of constant attention, has involved the use of over 50 different species of *Rubus*, and has resulted in the origination and introduction of 10 new commercial varieties, mostly obtained through various hybridizations of dewberries, blackberries and raspberries. Among these may especially be mentioned the Phenomenal, a hybrid of the Western dewberry (*R. ursinus*) and the Red raspberry (*R. ideaus*), fixed in the first generation, which ripens its main crop far ahead of most raspberries and blackberries, and the berry is of enormous proportions and exquisite quality; the Iceberg, a cross-bred white blackberry derived from a hybridization of the Crystal White (pistillate parent) with the Lawton (staminate parent) and with beautiful snow-white berries so nearly transparent that the small seeds may be seen in them; the Balloon berry, selected from a complicated cross of many species; the Himalaya, the most rapid growing and by far the most productive blackberry in existence, of unequalled quality and of great value in California and other mild climates; also a wonderful series of absolutely thornless blackberries of great productiveness and superior quality. The thornless berry has not yet been generally introduced, but will no doubt supplant the thorny varieties nearly everywhere. An interesting feature of Mr. Burbank's brief account, in his «New Creations» catalogue of 1894, of the berry experimentation, is a reproduction of a photograph showing «a sample pile of brush 12 feet wide, 14 feet high and 20 feet long, containing 65,000 two- and three-year-old seedling berry bushes (40,000 Blackberry X Raspberry hybrids and 25,000 Shaffer X Gregg hybrids) all dug up with their crop of ripening berries.» The photograph is introduced to give the reader some idea of the work necessary to produce a satisfactory new race of berries. «Of the 40,000 Blackberry-Raspberry hybrids of this kind 'Paradox' is the only one now in existence. From the other 25,000 hybrids two dozen bushes were reserved for further trial.»

Leaving Burbank's other fruit and berry creations unmentioned, we may refer to his curious cross-bred walnut results, the most astonishing of which is a hybrid between *Juglans californica* (staminate parent) and *J. regia* (pistillate parent), which grows with an amazing vigor and rapidity, the trees increasing in size at least twice as fast as the combined growth of both parents, and the clean-cut, glossy, bright-green leaves, from two to three feet long, having a sweet odor like that of apples. This hybrid produces no nuts, but curiously enough the result of a nearly similar hybridization (i.e., pollen from nigra on pistils of californica) produces in abundance large nuts of a quality superior to that possessed by either parent. These new species of walnut are now known as «Paradox» and «Royal» respectively.

Of new vegetables Burbank has introduced, besides the Burbank and several other new potatoes, new tomatoes, sweet and field corn, squashes, asparagus, etc. Perhaps the most interesting of his experiments in this field is the successful production of a whole series of giant spineless and spiculess cactus, both for forage and fruit (the spicules are the minute spines, much more dangerous and harder to get rid of than the conspicuous long, thorn-like spines), edible for stock, and indeed for man. This work is chiefly one of pure selection, for the cross-bred forms often seem to tend strongly to revert to the ancestral spiny condition.

Among the many new flower varieties originated by Burbank may be mentioned the Peachblow, Burbank, Coquito and Santa Rosa roses, the Splendor, Fragrance (a fragrant form) and Dwarf Snowflake callas, the enormous Shasta and Alaska daisies, the Ostrich plume, Waverly, Snowdrift and Double clematises, the Hybrid Wax myrtle, the extraordinary Nicotunia, a hybrid between a large, flowering Nicotiana and a petunia, numerous hybrid Nicotianas, a hundred or more new gladioli, an ampelopsis, numerous amaryllids, various dahlias, the Fire poppy (a brilliant flame-colored variety), striped and carnelian poppies, a blue Shirley (obtained by selection from the Crimson field poppy of Europe), the Silver lining poppy (obtained by selection from an individual of *Papaver umbrosum* showing a streak of silver inside) with silver interior and crimson exterior, and a crimson California poppy (*Escholtsia*) obtained by selection from the familiar golden form. Perhaps his most extensive experimenting with flowers has been done in the hybridizing of lilies, a field in which many botanists and plant breeders have found great difficulties. Using over half a hundred varieties as a basis of his work, Burbank has produced a great variety of new forms. «Can my thoughts be imagined,» he says, in his ‘New Creations’ of 1893, «after so many years of patient care and labor (he had been working over 16 years) as, walking among them (his new lilies) on a dewy morning, I look upon these new forms of beauty, on which other eyes have never gazed? Here a plant six feet high with yellow flowers, beside it one only six inches high with dark red flowers, and further on one of pale straw, or snowy white, or with curious dots and shadings; some deliciously fragrant, others faintly so; some with upright, others with nodding flowers, some with dark green, woolly leaves in whorls, or with polished, light green, lance-like, scattered leaves.»

So far no special reference has been made to the more strictly scientific aspects of Burbank's work. Burbank has been primarily intent on the production of new and improved fruits, flowers, vegetables, trees, grains and grasses for the immediate benefit of mankind. But where biological experimentation is being carried on so extensively it is obvious that there must be a large accumulation of data of much scientific value in its relation to the great problems of heredity, variation and species-forming. Burbank's experimental gardens may be looked on from the point of view of the biologist and evolutionist as a great laboratory in which, at present, masses of valuable data are, for lack of time and means, being let go unrecorded. Of Burbank's own particular scientific beliefs touching the «grand problems» of heredity we have space to record but two; first, he is a thorough believer in the inheritance of acquired characters, a condition disbelieved in by the Weismann school of evolutionists; second, he believes in the constant mutability of species, and the strong individuality of each plant organism, holding that the apparent fixity of characteristics is a phenomenon wholly dependent, for its degree of reality, on the length of time this characteristic has been ontogenetically repeated in the phylogeny of the race. See PLANT-BREEDING.

For other accounts of Burbank and his work, consult articles in the illustrated magazines; ‘New Creations in Plant Life,’ by W. S. Harwood. Burbank has written 12 large volumes, ‘Luther Burbank, His Methods and Discoveries and Their Practical Application’; ‘The Training of the Human Plant’; and his series of catalogues, 1893–1901, called ‘New Creations’; and has several other volumes under preparation covering an enormous amount of experimental data on plant life in all its aspects.

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BURBOT, a fresh-water fish (*Lota lota*) of the cod family, inhabiting northern Europe and America. It is numerous in the inland waters of the Northern States and Canada, where it displays the nocturnal voracity of its race. It ordinarily weighs about five pounds, but has little market value. It is more often called cusk, ling or loche among us, than burbot, which is the British designation.

BURBRIDGE, Stephen Gano, American soldier: b. Scott County, Ky., 19 Aug. 1831; d. 1894. He organized the famous 26th Kentucky Regiment, which he led for the Union at Shiloh, where he was promoted to the rank of brigadier-general of volunteers. He was engaged in the Vicksburg expedition under General Grant; led the charge at Arkansas Post and at Port Gibson, being the first to enter each of these places; was retired with the brevet of major-general in 1865.

BURCH, Charles Sumner, American Protestant Episcopal bishop: b. Pinckney, Mich., 30 June 1855. A graduate of the University of Michigan in 1875; after engaging in publishing business in Chicago; he was editor of the Grand Rapids *Evening Press* from 1897 to 1905. He had taken deacon's orders in 1895 and was ordained to the priesthood in 1905. He was rector of Saint Andrew's, Staten Island, N. Y., until 1911, when he was consecrated suffragan bishop of New York.

BURCHARD, Samuel Dickinson, American clergyman: b. Steuben, N. Y., 6 Sept. 1812; d. Saratoga, N. Y., 25 Sept. 1891. He was graduated at Centre College in 1836 and became a prominent lecturer in Kentucky on the anti-slavery and temperance questions. He was for many years a Presbyterian pastor in New York. In 1885 he became pastor emeritus. During the presidential campaign of 1884 a company of clergymen, about 600 in number, called on James G. Blaine, the Republican candidate, at the Fifth Avenue Hotel, New York. Dr. Burchard made an address, in which he affirmed that the antecedents of the Democracy were «rum, Romanism and rebellion,» and this denunciatory speech on the very eve of the election created intense excitement throughout the United States and alienated from Blaine many Democratic votes upon which he had reckoned. It is generally conceded that Burchard was thus largely instrumental in electing Grover Cleveland.

BURCHIELLO, boor-chē-ĕl'lō, **Domenico**, Italian poet: fl. 15th century at Florence, where he was probably born. He died at Rome, about 1449. He was the son of a barber named Giovanni, and was called originally only Domenico. He assumed the name of Burchiello afterward for reasons that cannot be assigned. His fame began about 1425. He was first registered as a barber in 1432. Some writers have reproached him for shameful vices, and represented him as a low buffon who did everything for money. Others have defended him. His shop was so famous that learned and unlearned, high and low, assembled there every day, and Cosmo the Great caused a picture of it to be painted on one of the arches of his gallery. It appears here divided into two portions; in one Burchiello is acting the part of a barber; in the other that of a musician and poet. The portrait of Burchiello himself is painted over his shop. It is extremely difficult to decide upon the absolute value of his satires, as the local and personal allusions in them are obscure. They were composed of his contemporaries, with a studied obscurity and extravagance of expression. His style is, nevertheless, pure and elegant. His burlesque sonnets are enigmas, of which we have no intelligible explanation, notwithstanding what Doni has done. The narrative and descriptive parts are very easily understood; but the wit they contain is, for the most part, so coarse, that the satire fails of producing its effect. They are, on the whole, lively, but licentious. The best editions of his sonnets are those of Florence (1568) and of London (1757).

BURCKHARD, Max Eugen, Austrian writer on jurisprudence, poet, novelist and dramatist: b. Korneuburg 1854; d. 1912. He studied at the University of Vienna, rendered efficient service for several years as a member of the ministry of education, and received in 1890 his appointment as director of the Hoftheatre (court theatre) in Vienna, an office so well suited to his talents that it called forth a series of appropriate works. Thus, in 1896 he published ‘Das Recht des Schauspielers’; next followed the comedy ‘Rat Schrimpf’ (Berlin 1905); ‘Gottfried Wunderlich’ (1906); ‘Das Theater’ (Frankfurt am Main 1907); ‘Im Paradiese’ (Wien 1907); ‘Die verfixten Frauenzimmer’ (1909); ‘Jene Asra’ (Salzburg 1910); a novel of distinction entitled ‘Trincaria’ in 1910; and in 1912 his ‘Cillis — Sina — Gabrielle: Briefe von und an Carl Rahl.’ It should be noted that, before his appointment as director of the court theatre, he had published his ‘Gesetze und Verordnungen in Kultussachen’ (1887) and the poem entitled ‘Das Lied vom Tannhäuser’ (1888).

BURCKHARDT, boork'hart, **Jakob**, Swiss author, eminent as a student and critic of Italian art and as an historian: b. Basel 1818 d. 1897. At the university of his native town, and later at the University of Berlin, he studied history and theology. His first appointment was as professor of the history of art and civilization at the University of Basel, and this connection he maintained to the end of his life, with the exception of a few years spent at Zürich as an instructor in the Polytechnic Institute of that city. His most important works are ‘Die Zeit Constantins des Grossen’ (Leipzig 1880); ‘Der Cicerone; Eine Anleitung zum Genuss der Kunstwerke Italiens, 4 Auflage, unter Mitwirkung des Verfassers und anderer Fachgenossen bearbeitet von Dr. Wilhelm Bode’ (parts 1 and 2, Leipzig 1879) with its English versions, ‘The Cicerone, or Art Guide to Painting in Italy’ (ed. by A. von Zahn and trans. by Mrs. A. H. Clough, London 1873), and a translation of that portion which relates to painting, published in New York in 1910; ‘Die Kultur der Renaissance in Italien’ (1st ed., 1860, 8th ed., 1902, and English translation, ‘The Civilization of the Renaissance in Italy,’ London 1890); ‘Geschichte der Renaissance in Italien’ (3 ed., 1890–91); ‘Griechische Kulturgeschichte’ (3 vols., 1898–1900). Material additions to and enhancement of the value of ‘Der Cicerone’ must be credited to Dr. Bode and the other editors.

BURCKHARDT, Johann Karl, German astronomer: b. Leipzig, 30 April 1773; d. 22 June 1825. He acquired a fondness for astronomy from the study of the works of Lalande, and made himself master, at the same time, of nearly all the European languages. He wrote a Latin treatise ‘On the Combinatory Analytic Method’ (Leipzig 1794). He then studied practical astronomy with Baron von Zach at the latter's observatory on the Seeberg, near Gotha, and assisted his patron, from 1795–97, in observing the right ascension of the stars. Von Zach recommended him to Lalande, at Paris, who received him at his house 15 Dec. 1797. Here he distinguished himself by the calculation of the orbits of comets; participated in all the labors of Lalande and those of his nephew, Lefrançois Lalande; took an active part in the observatory of the École Militaire; and translated the first two volumes of Laplace's ‘Mécanique Céleste’ into German (Berlin 1800–02). Being appointed adjunct astronomer by the board of longitude, he received letters of naturalization as a French citizen 20 Dec. 1799. His important treatise on the comet of 1770, which had not been visible for nearly 30 years, although, according to the calculations of its orbit, it should have returned every five or six, was rewarded with a gold medal by the Institute in 1800. This treatise, which proposed some improvements in Dr. Obler's mode of calculation, is contained in the ‘Memoires de l'Institut’ for 1806. During this year he was made a member of the department of physical and mathematical sciences in the Academy; in 1818 was made a member of the board of longitude; and, after Lalande's death, astronomer in the observatory of the École Militaire. In 1814 and 1816 he published in French, at Paris, ‘Tables to Assist in Astronomical Calculations.’ He also wrote some treatises in Von Zach's ‘Geographical Ephemerides.’

BURCKHARDT, John Lewis, English African explorer: b. Lausanne, Switzerland, 24 Nov. 1784; d. Cairo, 17 Oct. 1817. He was educated at Neuchatel, Leipzig and Göttingen. In 1806 he went to London with introductions to Sir Joseph Banks, who accepted his proffered services on behalf of the African Association, founded to explore the interior of Africa. After studying at Cambridge, and inuring himself to hardship and exposure, he sailed for Malta in 1809; and from Malta he went to Aleppo as an Oriental, and studied there for two years Arabic and Mohammedan law. In 1810 he made a tour of Palmyra, Damascus and Baalbek; in 1812 he journeyed through Palestine and Arabia to Egypt; in 1813 he traversed the Nile above Assouan; in 1814 he visited Mecca, successfully personating a Moslem pilgrim; 1815 saw him at the Prophet's tomb at Medina, and he journeyed to Suez and also made the ascent of Mount Sinai in 1816. He died with the main purpose of his life unfulfilled, the exploration of the sources of the Niger, and was buried in his assumed character of a devout Moslem pilgrim. His collection of 350 volumes of manuscript he bequeathed to Cambridge University. His works were all published posthumously: travels in Nubia (1819), in Syria (1822), in Arabia (1829); Notes on the Bedouins and Wahabys (1830); ‘Arabic Proverbs’ (1830).

BURDEKIN, a river of the northeast of Queensland, with a course of about 350 miles. With its affluents it waters a large extent of country, but it is useless for navigation.

BURDEN, Henry, American inventor: b. Dumblane, Scotland, 20 April 1791; d. Troy, N. Y., 19 Jan. 1871. He was brought up on a farm, and at an early age showed his inventive genius by making a variety of labor-saving machinery, including a threshing-machine. He came to the United States in 1819 and engaged in the manufacture of agricultural implements. He invented an improved plow; the first cultivator made in this country; machines for making horse-shoes and hook-headed spikes used on railroads; a self-acting machine for rolling iron into bars, and a new machine for making horse-shoes, which received a rod of iron and turned out completed shoes at the rate of 60 a minute.

BURDEN OF PROOF, in legal procedure, the obligation to establish by evidence certain disputed facts. As a general rule this burden lies on the party asserting the affirmative of the issue to be tried or question in dispute, or on the party who would fail if no evidence were adduced on either side. Burden of proof is to be distinguished from *prima facie* evidence or a *prima facie* case. Generally, when the latter is shown, the duty imposed upon the party having the burden will be satisfied; but it is not necessarily so. In criminal cases, on the two-fold ground that a prosecutor must prove every fact necessary to substantiate his charge against a prisoner, and that the law will presume innocence in the absence of convincing evidence to the contrary, the burden of proof, unless shifted by legislative interference, will, in criminal proceedings, be on the prosecuting party, though in order to convict he must necessarily have recourse to negative evidence. The burden of proof throughout is on the government. This subject is treated by all writers on Evidence, as Taylor, Roscoe and Powell in England; Dickson in Scotland and Greenleaf in the United States. Consult also Bentham's ‘Rationale of Judicial Evidence.’

BURDER, George, Congregational minister: b. London, 5 June 1752; d. 5 June 1832. He started life as an engraver and artist and drifted partially into journalism. He began preaching in 1776 and was ordained pastor two years later, but was not publicly recognized until 1784. In the meantime he had been doing the work of a traveling preacher throughout England and Wales. He initiated Sunday schools at Coventry (1785) and he was chief founder of the «Association of Ministers for the Spread of the Gospel at Home and Abroad» (1793), now called the «Warwickshire County Association,» which has done much to encourage foreign missions. He helped to form the «Religious Tract Society.» In 1803 he became secretary of the London Missionary Society, a post he held until 1827. He also edited the *Evangelical Magazine* for several years, and in 1804 he was instrumental in the foundation of the British and Foreign Bible Society. Among his works are ‘The Welsh Indians, a Collection of Papers Respecting a People whose Ancestors Emigrated from Wales to America in the year 1170 with Prince Madoc’ (1797); ‘Missionary Anecdotes’; ‘The Pilgrim's Progress, an Epic Poem,’ and several volumes of poems. Consult Bennett's ‘History of Dissenters’ (1839).

BURDETT, Sir Francis, English politician: b. 25 Jan. 1770; d. 23 Jan. 1844. He was educated at Westminster and after two years at Oxford made a continental tour. In 1796 he obtained a seat in Parliament through the patronage of the Duke of Newcastle; but he soon abandoned the Tory party and made himself conspicuous by his advocacy of liberal measures. In 1802 he stood for Middlesex but though at first elected he finally lost his seat in 1806 after much costly litigation. He was more successful in 1807 at Westminster where his election at the head of the poll was hailed as a great popular triumph. In 1810 he published a letter in Cobbett's *Political Register,* denying the right of the House of Commons to imprison for libel, as they had recently done in the case of John Gale Jones. This letter, having been brought under the notice of the House, was declared a gross breach of its privileges, and a warrant was issued by the speaker for the committal of Sir Francis to the Tower. He denied the legality of the warrant and declared his determination to surrender only to force. The public mind was strongly agitated, but prorogation of Parliament relieved him from his imprisonment in the Tower, and he became perhaps the most popular man in the kingdom. In attaining this popularity he was greatly aided by the graces of his appearance and the talents which he undoubtedly possessed. Ultimately, however, his fervor cooled, and he owed his last seat in Parliament to the Conservatives of Wiltshire.

BURDETT, Sir Henry, K.C.B. (1897), K.C.V.O. (1908), English author, publicist and statistician: b. 1845. Was superintendent of the Queen's Hospital, Birmingham, and the Seaman's Hospital, Greenwich, and secretary of the share and loan department of the London Stock Exchange. He was founder and editor of *The Hospital.* His works are numerous and cover a wide range. Among them are ‘The Sinking Fund of the National Debt’; ‘The Patriotic Fund’; ‘How to Become a Nurse’; ‘Dwellings of the Middle Classes’; ‘Helps in Sickness’; ‘Health’; ‘The Future of Hospitals’; ‘Official Intelligence of British, American and Foreign Securities’ (17 vols.); ‘The National Debts of the World’; ‘Local Taxation in England and Wales’; ‘Seventeen years of Securities’; ‘Colonial Loans and Development’; ‘The Admiralty and the Country’; ‘Hospitals and Asylums of the World' (4 vols.); 'Hospitals and Charities'; 'Hospitals and the State'; 'Architects, Hospitals and Asylums'; 'A Practical Scheme for Old Age Pensions'; 'The Nursing Profession'; 'Housing of the Poor'; 'Official Nursing Directory'; 'London Water Company'; 'Light Railways'; and 'Municipal, County and Indian Finance.'

BURDETT-COUTTS, Right Hon. **Angela Georgina** (Baroness), English philanthropist: b. 21 April 1814; d. London, 30 Dec. 1906. In 1837 she inherited much of the property of her grandfather, Thomas Coutts, the banker, on the death of his widow, the Duchess of Saint Albans (formerly the actress, Miss Mellon). Besides spending large sums of money in building and endowing churches and schools, she endowed the three colonial bishoprics of Cape Town, Adelaide and British Columbia. She founded an establishment in South Australia for the improvement of the aborigines, and established a fishery school at the Irish village of Baltimore (1887). To the city of London she presented, besides several handsome fountains, the Columbia Market, Bethnal Green (1870), for the supply of fish in a poor district. She also built Columbia Square, consisting of model dwellings at low rents, for about 300 families. The home established by her at Shepherd's Bush has rendered great assistance to many unfortunate women, and the People's Palace owes much to her generosity. In 1871 she was created a peeress in her own right as Baroness Burdett-Coutts. In 1877 she organized the Turkish Compassionate Fund, to relieve the sufferings of the peasants in Turkey, and in recognition of her services the Sultan conferred upon her the Order of the Medjidie, In 1881 she was married to William Ashmead-Bartlett, who in 1882 obtained the royal license to assume her name.

BURDETT-COUTTS, William Lehman Ashmead-Bartlett, English philanthropist: b. in the United States in 1851, the son of the late Ellis Bartlett of Plymouth, New England. He was graduated at Keble College, Oxford, in 1876, and married in 1881 Angela, Baroness Burdett-Coutts, whose name he assumed. As commissioner for the Baroness' Turkish Compassionate Fund he proceeded to the theatre of the Russo-Turkish War in 1877; and subsequently largely developed her schemes for relieving Irish distress and aiding Irish fishermen. The food supply for the poor of London is a subject that has deeply interested him, and he has been instrumental in carrying through some useful acts of Parliament, notably the Hempstead Heath Act of 1885. He has represented Westminster in the House of Commons since 1885.

BURDETTE, Robert Jones, American humorist, lecturer, writer, preacher: b. Greensboro, Pa., 30 July 1844; d. Pasadena, Cal., 19 Nov. 1914. Removed in boyhood to Peoria, Ill. He was educated in public schools; D.D., Kalamazoo University, Michigan, 1908; LL.D., Occidental College, California, 1913. Served as private in the 47th Illinois Volunteers, 1862-65. In 1869 he became night editor of the Peoria *Transcript,* and afterward was associated with other Peoria papers. He became associate editor of the Burlington, Iowa, *Hawkeye* in 1872, where he made a reputation as a humorist. Later he was on staff of the Brooklyn *Eagle,* and was editorial contributor to the Los Angeles *Times,* and to many periodicals. Began to lecture in 1876. He became a licensed minister of the Baptist Church in 1887, was ordained in 1903, and became pastor of the Temple Baptist Church, Los Angeles; pastor emeritus, July 1909; and was city commissioner of Pasadena, Cal. He published 'Hawkeyetems' (1877); 'Rise and Fall of the Moustache' (1879); 'Life of William Penn' (1882); 'Innach Garden' (1897); 'Sons of Asaph'; 'Chimes from a Jester's Bells'; 'Temple and Templars'; 'Smiles Yoked with Sighs' (poems, 1900); 'Silver Trumpets' (poems); 'Old Time and Young Tom' (1912); 'Drums of the Forty-Seventh' (1914).

BURDICK, Francis Marion, American jurist and author: b. De Ruyter, N. Y., 1 Aug. 1845. He was graduated at Hamilton College in 1869, and at its law school in 1872. He practised law in Utica, N. Y., from 1872 to 1883, and was later professor of law at Hamilton College and at Cornell. From 1891 he was professor of law at Columbia University, and in 1907 was appointed commissioner on uniform State laws for New York. Besides numerous articles in law journals his published works include 'The Law of Sales' (3d ed., 1913); 'The Law of Torts' (1905; 2d ed., 1908); 'Law of Partnership' (2d ed., 1906); 'Essentials of Business Law' (1908).

BURDOCK, a small genus (*Arctium*) of coarse perennial or biennial herbs of the family *Asteraceæ,* natives of temperate Asia and Europe, but widely distributed as weeds throughout the world. Common burdock (*A. lappa*), which often attains a height of four feet, is sometimes planted in Japan, where it has been improved by cultivation, for its enlarged parsnip-like roots, which are eaten as a boiled vegetable. Formerly the roots were used in medicine, but they seem to be generally classed with many other domestic remedies of doubtful value. The plant is best known as a weed in waste land, but usually on good soil. Its globular burs become attached to the wool of sheep and to clothing. Their presence injures the price of wool.

BURDON-SANDERSON, Sir **John Scott,** English physician: b. Jesmond, Newcastle-on-Tyne, 21 Dec. 1828; d. 23 Nov. 1905. He was graduated at Edinburgh University in 1851 and afterward studied at Paris, settling in London as a practising physician in 1853. In 1856, while medical officer for Paddington, he first gave proofs of the eminence to which he was to attain. In 1870 he gave up his hospital appointments and a valuable private practice to devote himself exclusively to scientific research. He held the appointments of professor of practical physiology and histology at University College, London, 1871-77; was Jodrell professor of physiology, 1874-82; Wayneflete professor of physiology at Oxford, 1882-95; and regius professor of medicine at the same university, 1895-1903. He is regarded as the virtual founder of the medical school at Oxford. His methods of research into the diseases of animals occasioned the violent opposition of the anti-vivisectionists. He accomplished much in the way of elucidating the true character of cholera and tuberculosis. He was created a baronet in 1899, and died without issue. He contributed many papers to scientific publications, and a ‹Memoir,› which contains some of his addresses, edited in part by his widow, was published in 1911.

BURDWAN, or BARDWAN, India, town and capital of a division of the same name in the lower provinces of Bengal, on the left bank of the Damoda, 68 miles northwest of Calcutta, with which it is connected by railway. There is a titular rajah of Burdwan, who resides here in a spacious palace, with gardens, etc.; and there are also a large collection of temples and a shrine of Pirba-haram. Pop. 34,477. The division has an area of 13,956 square miles, and a population of about 8,250,000, and is divided into the districts of Burdwan, Bankura, Birbhum, Hugli, Midnapur and Howrah. The chief crops are sugar, indigo, tobacco, cotton and the usual cereals. Mulberry-trees are cultivated and coal is raised.

BUREAU, the chamber or official apartments of an officer of government, and the body of subordinate officials who labor under the direction of a chief. The term «bureau system,» or «bureaucracy,» is applied to those systems of government in which the business of administration is carried on in departments, each under the control of a chief; and is opposed to those in which the officers of government have a co-ordinate authority. Sometimes a mixture of the two systems is found. Thus the business of the executive branch of government may be carried on by bureaus, while the administration of justice is in the hands of co-ordinate judges. In the United States, bureau is the universal word for a chest of drawers.

BUREAU OF ANIMAL INDUSTRY, The. See Agriculture, Department of.

BUREAU OF BIOLOGICAL SURVEY, The. See Agriculture, Department of.

BUREAU OF CHEMISTRY, The. See Agriculture, Department of.

BUREAU OF CROP ESTIMATES, The. See Agriculture, Department of.

BUREAU OF ENTOMOLOGY, The. See Agriculture, Department of.

BUREAU OF PLANT INDUSTRY, The. See Agricultural, Department of.

BUREAU OF SOILS, The. See Agriculture, Department of.

BUREAUCRACY, bū-rō'cra-cē, a form of political organization through which the government is carried on by means of bureaus, each of which manages a particular branch of state business. This form of organization is admirably adapted to securing responsibility, since each bureau is hierarchically organized with a chief at its head on whom rests the final responsibility, whereas in the collegial or board system a number of persons of coequal authority divide the responsibility. While the officials of bureaucracies are usually trained and experienced administrators, little affected by public opinion, their tendency is to develop a caste spirit, to overemphasize administrative routine and to become victims of «red tape» and excessive formalism. They fail to stimulate interest in public affairs or to cultivate patriotism among the masses, thus becoming «pedantocracies.» Consult Garner, J. W., ‹Introduction to Political Science› (New York 1910); Goodnow, F. J., ‹Comparative Administrative Law› (New York 1903).

BURETTE, a graduated glass tube occasionally used for dividing a given portion of any liquid into small quantities of a definite amount.

BURG, boorg, **Adriaan van der,** Dutch painter: b. Dordrecht 1693; d. 1733. He studied under Arnold Houbraken, distinguished himself by his portraits, and acquired a reputation which would have procured him an independence. But intemperate habits rendered his talents of no avail, and hurried him to a premature grave. His freedom of touch and fine coloring are his distinguished excellences. His best-known pieces are two large pictures at Dordrecht, one of which gives on a single canvas portraits of the managers of the orphan hospital, and the other portraits of the officers of the Mint.

BURG, Johann Tobias, Austrian astronomer: b. Vienna 1766; d. 1834. He attracted the notice of Van Swieten, who was then at the head of the commission appointed to reform the scholastic establishments of Austria, and through his patronage obtained the means of prosecuting the study of mathematics, and more especially of astronomy, for which he showed a decided inclination. In 1791 he became professor of physics at Klagenfurt, and in 1792 was appointed colleague of Trisnecker at the Observatory of Vienna. In 1798, the French Institute having proposed a prize for the determination, by at least 500 observations, of the mean place of the apogee and ascending node of the moon, Burg sent in a memoir in which the determination was made by a most accurate and ingenious method, not from 500 but 3,232 observations. The tables contained in it were afterward published by the Institute, and constitute the chief foundation of his fame. In 1813 he became almost entirely deaf and retired from public life to Wiesenau, Carinthia.

BURG, Prussia, a town in the province of Saxony, 12 miles northeast of Magdeburg, on the Ihle, where it joins a canal uniting the Havel with the Elbe. It has four churches, a hospital, a gymnasium and a well-endowed institution for the bringing up of orphan children, and is the seat of civil and judicial administration for the circle. Its manufactures are extensive, especially of woolens, for which it was a centre as early as the 12th century. Cloths for army purposes are largely made. There are also spinning mills, dye works, machine works, tanneries, oil works, brick kilns, foundries and a large trade in farm produce. The prosperity of Burg dates from the end of the 17th century, when a large number of French, Palatinate and Walloon refugees took shelter there. Pop. 24,074.

BURGAGE TENURE, in England, a tenure in socage, whereby burgesses, citizens or townsmen hold their lands or tenements of the King or other lord for a certain yearly rent. In Scotland that tenure by which the property in royal burghs is held under the Crown, proprietors being liable to the (nominal) service of watching and warding, or, as it is commonly termed, «service of burgh, used and wont.»

BURGAS, boor-gäs', or **BOURGAS**, Turkey, a seaport of the province of eastern Rumelia, situated on the Black Sea. The bay on which it stands is of sufficient depth for large vessels, and the exports are grain, iron, butter, wine and also wooden goods for Constantinople. It is the terminal of the Sofia-Burgas Railway, and contains several mosques and Christian churches. The principal source of the prosperity of the town is the manufacture of pottery, pipe-bowls, cups, etc., for which a superior clay is found in the neighborhood. Pop. about 12,000.

BURGDORF, boorg'dôrf, Switzerland, a town in the canton of Bern, situated on the Emmen. It is the market for the linen goods and cheeses of the Emmenthal, and manufactures linen, wool, tobacco and chocolate. The castle which stands here was formerly a place of great strength. Pestalozzi resided from 1798 to 1804 in the château of Burgdorf, and converted it into an educational institution. In the vicinity are the baths of Sommerhaus. Pop. 9,381.

BURGEO ISLANDS, Newfoundland, a group of islands on the southern coast, much visited by summer tourists and artists from the Eastern States and Canada, lat 47° 33' N. and long. 57° 44' W. The population is chiefly engaged in fishing. Burgeo, the principal town, has a population of less than 1,000. In 1765 Captain Cook made an observation of the sun's eclipse here.

BÜRGER, Gottfried August, German poet: b. 1 Jan. 1748, at Wolmerswende, near Halberstadt: d. Göttingen, 8 June 1794. He showed an early predilection for solitary and gloomy places and the making of verses, for which he had no other model than hymnbooks. He learned Latin with difficulty. In 1764 he studied theology at the University of Halle, and in 1768 he went to Göttingen, in order to exchange theology for law, but soon formed connections here equally disadvantageous to his studies and his morals, so that his grandfather, who had hitherto maintained him, withdrew his support. The friendship of several distinguished young men at the university was now of great service to him. He studied the ancient classics and the best works in French, Italian, Spanish and English, particularly Shakespeare, and the old English and Scottish ballads. Percy's 'Reliques' was his constant companion. His poems soon attracted attention. In 1772 he obtained the office of baillie in Alten-Gleichen, but throughout his life he was involved in pecuniary difficulties. In 1774 he married the daughter of a neighboring baillie, named Leonhart, but his marriage was unfortunate. He conceived a violent passion for the sister of his wife and married her in 1784, soon after his first wife's death. She also, his celebrated «Molly,» died the first year of their marriage. At the same time he was obliged, by intrigues, to resign his place. He was made professor extraordinary in Göttingen, but received no salary, and this favorite poet of the nation was obliged to gain his living by poorly rewarded translations for booksellers. A third marriage in 1790, with a young lady of Swabia, who had publicly offered him her hand in a poem, completed his misfortunes; he procured a divorce from her two years afterward. The government of Hanover afforded him some assistance shortly before his death. His songs, odes, elegies, ballads, narrative poems and epigrams hold a very high place in German literature, Schlegel especially commending his work, though Schiller criticised him very severely. The first collection of his poems appeared in Göttingen in 1778. His complete works were first published by Reinhard at Göttingen in four volumes in 1796–98, and this edition has been repeatedly published since. Other editions of his works and letters have also been published, and his life has been written by Döring; Pröhle, 'G. A. Bürger: Sein Leben und Seine Dichtungen' (Leipzig 1865), and others.

BURGER, Ludwig, German historical painter and illustrator: b. Cracow, 19 Sept. 1825; d. Berlin, 22 Oct. 1884. He studied at the Berlin Art Academy, at the same time working at book-illustrating; he was also a pupil of Couture in Paris. Among his best drawings are the illustrations for the works of La Fontaine and a collection of 20 plates known as 'Die Kanone.' After 1869 he devoted himself to decorative painting, his most important work in this line being the walls and ceilings in the Berlin City Hall (1870) and the colossal figures symbolizing the warlike virtues at the School of Cadets at Lichterfelde (1878).

BURGERS, Thomas Francis, Transvaal statesman: b. Cape Colony 1834; d. 1881. He was educated for the ministry at Utrecht and was pastor of the Dutch Reformed Church of Hanover, Cape Colony. Some of the rationalistic views he expressed led to his trial for heresy, but he was acquitted. He was elected President of the Transvaal republic in 1872 and held the office until 1877, when the republic was annexed by Great Britain.

BURGES, Tristam, American statesman and orator: b. Rochester, Mass., 26 Feb. 1770; d. Providence, R. I., 13 Oct. 1853. When 15 years old he attended a school in the vicinity for six weeks, and again the next year for six weeks more. This was all the instruction he received from others until he reached the age of 21. In September 1793, he entered Rhode Island College, now Brown University, graduated three years later with the first honors of his class and was admitted to the bar in 1799. He became a leader of the Federal party, and in 1811 was elected to a seat in the State legislature. In 1815 he was made chief justice of Rhode Island, and afterward became professor of oratory and *belles-lettres* in Brown University. In 1825 he was elected to Congress, and almost immediately achieved a national reputation by his speech on the judiciary. He continued in Congress until 1835. Many of his most brilliant efforts were in defense of the American tariff system, and his logic and sarcasm won for him an unrivaled reputation as a debater. Consult Bowen, 'Memoirs of Tristam Burges.'

BURGESS, Alexander, American Protestant Episcopal bishop: b. Providence, R. I., 31 Oct. 1819; d. Saint Albans, Vt., 8 Oct. 1901. He was a younger brother of George Burgess, first bishop of Maine. He was graduated from

Brown University in 1838, and from the General Theological Seminary in 1841. He was successively rector at East Haddam, Conn., 1842–43; Saint Mark's, Augusta, Me., 1843–54; Saint Luke's, Portland, Me., 1854–67; Saint John's, Brooklyn, N. Y., 1867–69; and Christ Church, Springfield, Mass., 1869–78. In 1878 he was consecrated first bishop of the diocese of Quincy, Ill. He wrote a popular religious textbook, ‘Questions for Bible-Classes and Sunday-schools’ (1855), and a ‘Memoir of the Life of George Burgess, First Bishop of Maine’ (1869).

BURGESS, Charles Frederick, American electrochemical engineer: b. Oshkosh, Wis., 5 June 1873. A graduate of the University of Wisconsin, he became instructor and assistant professor of electrical engineering there 1895 to 1900, organized the department of applied electrochemistry and chemical engineering. He developed several electrolytic processes and was appointed, in 1904, investigator of electrolytic iron alloys for the Carnegie Institute and president of the Northern Chemical Engineering Laboratories. He is author of ‘The Strength of the Alloys of Nickel and Copper with Electrolytic Iron’ (1910).

BURGESS, Daniel, English ecclesiastical writer: b. Staines, England, 1645; d. London, 26 Jan. 1713. He studied at Oxford but was not graduated because he would not conform to the established church. In 1667 he went to Ireland with Roger Boyle, Earl of Orrery, where he became head of a school established by the latter at Charleville. In 1685 he went to London where he soon attracted attention on account of his humor, vivacity and oratorical power. His publications include ‘Directions for Daily Holy Living’ (London 1690); ‘The Golden Snuffers’ (1697); ‘Proof of God's Being and of the Scriptures' Divine Origin’ (1697).

BURGESS, Edward, American naval architect: b. West Sandwich, Mass., 30 June 1848; d. Boston, 12 July 1891. He was educated at Harvard, whence he was graduated in 1871, and became secretary of the Boston Society of Natural History, being editor of the publications of that society. He was instructor of entomology at Harvard from 1879 to 1883. He then became a designer of sailing-yachts. In 1884 he designed the *Puritan*, the winner of the America's cup in 1885; and a year later the *Mayflower*, the winner in 1886. He was also the designer of the *Volunteer*, which won the cup in 1887.

BURGESS, [Frank] Gelett, American humorist and satirical writer, novelist and illustrator: b. Boston, 30 Jan. 1866. He was graduated from the Massachusetts Institute of Technology in 1887; was a draughtsman with the Southern Pacific Railroad 1887–90, and instructor in topographical drawing in the University of California. He was a designer 1893–94, and in 1895–97 he came prominently before the reading public as a publisher and writer of eccentric and humorous literature, such as his journal called *The Lark*, and poem, ‘The Purple Cow’ (1897). In 1898 he removed to London, but returned to America in 1900; in 1914–16 he was in Paris as correspondent of *Collier's Weekly*. He edited ‘Petit Journal des Refusées’ (1897), and has written ‘The Lark Almanac’ (1898); ‘Vivette’ (1898); ‘The Nonsense Almanac’ (1898); ‘The Lively City o' Ligg’ (1898); ‘Goops and How to be Them’ (1900); ‘A Joyous Journey Round the Year’ (1901); ‘Romance of the Commonplace’ (1902); ‘A Gage of Youth’ (1901); ‘Burgess Nonsense Book’ (1901); ‘More Goops’ (1903); ‘The Reign of Queen Isyl’ (with Will Irwin, 1903); ‘The Picaroons’ (with Will Irwin, 1904); ‘A Little Sister of Destiny’ (1905); ‘Are You a Bromide?’ (1906); ‘The White Cat’ (1907); ‘The Heart Line’ (1907); ‘The Maxims of Methuselah’ (1907); ‘Blue Goops and Red’ (1909); ‘Lady Méchante’ (1909); ‘Find the Woman’ (1911); ‘The Master of Mysteries’ (1912); ‘The Goop Directory’ (1912); ‘Love in a Hurry’ (1912); ‘The Master of Mysteries’ (1912); ‘Burgess Unabridged’ (1914); ‘The Romance of the Commonplace’ (new version, 1915).

BURGESS, George, American Protestant Episcopal bishop: b. Providence, R. I., 31 Oct. 1809; d. Haiti, 23 April 1866. After graduating at Brown University, and holding a tutorship in that college, he traveled in Europe, and studied for two years in the universities of Göttingen, Bonn and Berlin. He was rector of Christ Church in Hartford from 1834 to 1847, when he was consecrated first bishop of the diocese of Maine and became, at the same time, rector of Christ Church in Gardiner. Both offices he filled with great ability. He published two academic poems, a metrical version of a portion of the Psalms, ‘Pages from the Ecclesiastical History of New England’ (1847); ‘The Last Enemy Conquering and Conquered’ (1850), and various sermons.

BURGESS, George Kimball, American physicist and author: b. Newton, Mass., 4 June 1874. He studied at the Massachusetts Institute of Technology and at the University of Paris, later, in the former institution, and at the universities of Michigan and California, becoming instructor in physics. He was appointed associate physicist in the National Bureau of Standards in 1903, and editor of the *Journal of the Washington Academy of Sciences* in 1911. He translated Le Chatelier's ‘High Temperature Measurements’ (1901), and Duhem's ‘Thermodynamics and Chemistry’ (1901). His original work includes ‘Recherches sur la constante de gravitation’ (1901); ‘Experimental Physics, Freshman Course’ (1902); ‘The Measurement of High Temperatures,’ collaboration with H. Le Chatelier (1911; 3d ed. rev., 1912); ‘A Micropyrometer’ (1913).

BURGESS, James, Scottish archæologist: b. Kirkmahoe, Dumfriesshire, 14 Aug. 1832. He went to India in 1855, and there entered upon educational work in Calcutta and Bombay. From 1886–89 he was director-general of the archæological surveys of India. From 1872 to 1884 he published the ‘Indian Antiquary.’ His works include ‘The Temples of Shatrunjaya’ (1869); ‘The Rock Temples of Elephanta’ (1871); ‘Scenery and Architecture in Gujarat and Rajputana’ (1873); and other books; also many writings in the ‘Epigraphia Indica,’ and ‘Archæological Reports’ (1874–87).

BURGESS, John William, American educator: b. Cornersville, Tenn., 26 Aug. 1844. He was educated at Cumberland University, Lebanon, Tenn., and at Amherst College, Mass., where he was graduated in 1867; studied law, and began to practise in 1869. During this year he was appointed professor of English literature and political economy at Knox College, Galesburg, Ill. Two years later he studied in Göttingen, Leipzig and Berlin. On his return in 1874, he became professor of history and political science at Amherst, in 1876 professor of history, political science and international law in Columbia College, and in 1880 professor of constitutional and international history and law. In 1890 he became dean of the faculty of political science; also dean of the faculties of philosophy, pure science and fine arts, holding all of these offices until 1912, when he retired from the active service of the university. In 1906 he became Roosevelt professor of American history and institutions at Berlin University. He received the degrees of A.B., M.A. and LL.D. from Amherst College, the degree of LL.D. from Columbia, that of Ph.D. from Princeton, and from the University of Leipzig, Germany, and the degree of Ju.D. from the University of Berlin. In 1907 he received the order of the Prussian Crown from the Emperor of Germany, and the Albrecht's Order from the King of Saxony. He has published 'Political Science and Comparative Constitutional Law' (1890); 'The Middle Period of United States History' (1897); 'The Civil War and the Constitution' (1901); 'Reconstruction and the Constitution' (1902); 'The European War of 1914' (1915); 'The Reconciliation of Government and Liberty' (1915); 'The Administration of Rutherford B. Hayes' (1915); 'America's Relations to the Great War' (1917), and contributions to reviews on historical, political and legal topics.

BURGESS, Neil, American comedian: b. Boston 1846; d. 19 Feb. 1910. Not long after entering the theatrical profession, he undertook in a stage emergency to fill the place of an actress, and his success in the humorous female rôle assumed led to his entering that line permanently. He acted in 'Josiah Allen's Wife' and in 'Widow Bedott.' The latter was very popular, as was also 'Vim,' produced in 1883. 'The Country Fair,' a play which he brought out in 1889, ran for more than two years. Mr. Burgess finally undertook vaudeville acting. Consult Clapp and Edgett, 'Players of the Present' (Dunlap Society Publications, New York 1899).

BURGESS, a word used in somewhat varying senses, but generally meaning a freeholder, or a person invested with all the privileges of a citizen in a borough or corporate town. Those entered on the burgess roll of English boroughs are householders who have resided and paid rates for 12 months prior to July in any year. In the United States the uses of the word have undergone some specific changes, and in States having boroughs as political divisions, as Connecticut, New Jersey and Pennsylvania, it carries an implication of magisterial authority. See BOROUGH; BURGH.

BURGH, bĕrg, a corporate town or borough, more especially the Scottish term corresponding to the English borough, applied to several different kinds of corporations and to towns and cities in Scotland. There are three classes of burghs: (1) A burgh of barony is a certain tract of land created in a barony by the feudal superior and placed under the authority of magistrates. The right of electing these magistrates is vested by the charter of erection sometimes in the baron or superior of the barony and sometimes in the inhabitants themselves. (2) A royal burgh is a corporate body created by a charter from the Crown, the corporation consisting of the magistrates and burgesses of the territory erected into the burgh. The magistrates are generally a provost and baillies, dean of the guild, treasurer and common council. (3) A burgh of regality is a kind of burgh of barony which had legal jurisdiction (i.e., exclusive) over its own territory. The right of free trade in return for bearing certain public burdens was sometimes given to a burgh of barony, in which case it was known as a free burgh. In the United States, the termination «borough» was for generations added to the names of places, as in England. But under a decision of the United States Board on Geographic Names, the form «boro» was adopted, as in «Brattleboro.»

BURGHER, the name applied to a former subdivision of the Scottish Secession Church. The Secession, which originated through the withdrawal of Ebenezer Erskine and some other ministers from the Scottish establishment in 1732, split in two in 1747, part having felt free to take, while others refused, what they deemed an ensnaring burgess oath. They reunited in 1820 under the name of the Associate Synod, and, joining with the «Relief» in 1847, formed the United Presbyterian Church. The name «burgher» is also applied to any citizen of a borough or town.

BURGIN, George B., English novelist and journalist: b. Croydon, Surrey, 15 Jan. 1856. He became private secretary to Baker Pasha and accompanied him to Asia Minor as secretary of the Reform Commission in Armenia. In 1885 he returned to England and was for a time sub-editor of *The Idler*. Among his works are 'The Dance at the Four Corners'; 'Tuxter's Little Maid'; 'The Judge of the Four Corners'; 'Tomalyn's Quest'; 'Fortune's Footballs'; 'The Cattle Man'; 'The Hermits of Gray's Inn'; 'The Bread of Tears'; 'The Tiger's Claw'; 'A Son of Mammon'; 'A Wilful Woman'; 'The Shutters of Silence'; 'The Belles of Vaudroy'; 'Galahad's Garden'; 'This Son of Adam'; 'A Lady of Spain'; 'The Duke's Twins'; 'The Game of Hearts.'

BURGKMAIR, boork'mār, **Hans,** German painter and engraver: b. Augsburg 1473; d. about 1531. He is supposed to have been a pupil of Albert Dürer, but studied principally under Schongauer in Colmar, Alsace. Several of his frescoes and paintings in oil upon wood are still preserved in his native town; but though possessed of considerable merit, they have contributed far less to his fame than his woodcuts, in which he at least equaled Dürer, and has scarcely been surpassed by Holbein. In 1501 he executed three pictures of Roman basilicas, with scenes from the lives of patron saints, etc. He was one of the first exponents of the Renaissance in Germany. Among his most famous works are the 'Triumph of the

Emperor Maximilian I,) embracing 135 cuts, with a text written by that Emperor; and a series, 'The Wise King,' including 237 cuts, in which the deeds of the same ruler are represented. Consult Woltmann in Döhme's 'Kunst und Künstler' (Vol. I); Dornhöfer, 'Über Burgkmair und Dürer' (1903).

BURGLARY, at common law, the breaking and entering the house of another in the nighttime, with intent to commit a felony therein, whether the felony be actually committed or not. Burglary at common law, and in its first degree in the statutes of the various States, must, in general, be committed in a mansion-house actually occupied as a dwelling, but if it be left by the owner *animo revertendi,* though no person resides in it in his absence, it is still his mansion. But at common law burglary may be committed in a church. In New York (Penal Code § 496), and in some other States in which the New York statute has been adopted, burglary at common law, or in the first degree, must be committed in the night, but in New York and in some other States burglary in the second and third degrees may be committed in the daytime, and it is burglary in the third degree in New York feloniously to enter a building, whether inhabited or not, either in the daytime or night. Before the offense is complete there must be both a breaking and an entry or an exit. An actual breaking takes place when the burglar breaks or removes any part of the house, or the fastenings provided for it, with violence. Constructive breakings occur when the burglar gains an entry by fraud, conspiracy or threats. The least entry, with the whole or any part of the body, hand or foot, or with any instrument or weapon, introduced for the purpose of committing a felony, will be sufficient to constitute the offense. Burglary is a felony in all of the States, and in North Carolina it may be punished with death or imprisonment. In New York it is punishable as follows: Burglary in the first degree, imprisonment for not less than 10 years; second degree, not exceeding 10 years; third degree, not exceeding five years.

BURGLARY INSURANCE. A contract of indemnity, (1) against direct loss by burglary, or by burglary, theft or larceny of any of the assured's property, occasioned by its felonious abstraction from the interior of the house, building or apartment occupied by the assured as a residence by any domestic servant or other employee of the assured, or by any other person or persons, excepting a person whose property is insured; also against direct loss by damage to property insured, and to the premises, caused by burglars or thieves; known as residence burglary insurance; (2) against direct loss by burglary of merchandise owned by the assured, or held in trust or on commission, or sold but not delivered, occasioned by its felonious abstraction from the premises, occupied by the assured for business purposes, by any person or persons, after entry into the premises by the use of force and violence, of which there are visible marks upon the premises; also for direct loss by damage to the merchandise, furniture, fixtures or premises caused thereby; known as mercantile burglary insurance; (3) against direct loss by burglary of money, post office and revenue stamps, bullion, negotiable securities, drafts, promissory notes and merchandise, in consequence of the felonious abstraction of the same from a safe or safes after entry therein by the use of tools or explosives; also for direct loss by damage to the safe or safes, to the merchandise or to the furniture, fixtures or premises caused therefrom; known as mercantile safe insurance; (4) against direct loss by robbery of money, bullion, post office and revenue stamps, checks, negotiable securities, coupons, bills of exchange, drafts and notes, express, bank and post office money orders, watches, jewelry and other merchandise from the care or custody of any employee of the assured, while acting as messenger or paymaster, and while conveying the same to or from the place or places direct by the assured; also for direct loss by robbery of any of said property, feloniously, violently and forcibly abstracted from within the premises of the assured; also for direct loss by robbery, by force or violence of money intended for payrolls, from the person, care or custody of any employee of the assured, while acting as messenger or paymaster, or while conveying the same to and from the places directed by the assured; also for direct loss by robbery, of any property above described, from the safe or safes located on the premises of the assured, by any person or persons, after entry therein, by the use of tools or explosives; also for direct loss by damage to said property, or said safe or safes, or the furniture, fixtures or premises caused by such entry; known as combination messenger, paymaster, interior holdup and safe burglary insurance.

Burglary insurance was first written in this country in 1892, over 25 years ago, and from a very modest beginning, in which this form of underwriting was confined entirely to burglarizing private residences, the business has broadened and developed until the assured is protected now, not only in his home, against burglars, as well as theft and larceny by his own servants or employees, but also in his place of business, and even against loss by the robbery or holdup of his messenger or paymaster while going to or from the bank, or the store or office, or while en route to some distant place, with payrolls for employees working in a factory, mill or mine. The business grew quite slowly during the first five years, but in the next five years, from 1897 to 1901, premiums written amounted to $1,759,540, and losses paid to $622,765. During the next 10 years, the increase was much greater, with premiums of $20,000,000 and losses of $6,859,000. The figures for the five years ending 31 Dec. 1916, show premiums written, $21,938,671, and losses paid, $8,103,180, while for the year 1916 alone, the results were the most satisfactory in the entire history of the business, with 44 companies transacting some or all of the different forms above mentioned, and with premiums written of $5,427,977, and losses paid of $1,932,022.

EDWIN W. DELEON.

BÜRGLEN, Switzerland, village in the canton of Uri, about a mile from Altorf, is the traditional birthplace of William Tell. The supposed site of the patriot's house is now occupied by a chapel, erected in 1522, upon the walls of which are represented certain well-known scenes from his history. Pop. 1,852.

BURGOMASTER, the title of the chief magistrate of a city or a large town in Germany and the Netherlands, practically equivalent to mayor. He is elected by the people, but in most German towns he must have the confirmation of the government.

BURGOMASTER, a sailor's name for certain large domineering gulls of the genus *Larus*.

BURGON, John William, English Biblical scholar and critic: b. Smyrna, 21 Aug. 1813; d. Chichester, 4 Aug. 1888. He was the son of a Turkish merchant, was sent to study at London University, and later was graduated at Oxford in arts and finally in theology (1848). He became vicar of Saint Mary's, Oxford (1863), Gresham professor of divinity (1867) and dean of Chichester (1876). He was the bitterest and at the same time ablest and most learned of the critics and opponents of the revised New Testament including the revised Greek text. His publications, which are very numerous, include, in addition to controversial tracts and periodical literature, 'The Life and Times of Sir Thomas Gresham' (2 vols., London 1839); 'A Plain Commentary on the Four Holy Gospels' (8 vols., 1855); 'Ninety Short Sermons for Family Reading' (2 series, 2 vols. each, 1855–67); 'Portrait of a Christian Gentleman' (1859); 'The Revision Revised' (London 1883); 'The Lives of Twelve Good Men' (2 vols., 1888); 'The Traditional Text of the Holy Gospels Vindicated and Established and Causes of the Corruption of the Traditional Text' (1896).

BURGOS, boor'gōs, **Francisco Javier de,** Spanish statesman and poet: b. Motril, Granada, 1778; d. 1845. In his dramatic compositions he sought to restore the classical Spanish comedy. Among them are 'The Three Equals'; 'The Masked Ball'; and 'The Optimist and the Pessimist.' He wrote a celebrated 'Ode to Reason.'

BURGOS, Spain, city, the capital of the province of Burgos, and formerly of Old Castile, and once the residence of its kings. It stands on the declivity of a hill, on the right bank of the Arlanzon. The streets are narrow and dark, the finest in every respect being that called the Huerto del Rey. Places of promenade are numerous; the one most frequented, and justly forming the boast of the town, being the Espolon. The most remarkable structure is the cathedral, one of the finest buildings of the kind in Europe. It was begun in 1221, but was not finished for several centuries. It is built of white marble in the form of a Latin cross, and is about 300 feet long by 200 broad, and its size is such that service can be performed in eight chapels at once without confusion. Its interior, as well as its exterior, is of great magnificence, is adorned with fine carvings and paintings, and contains numerous monuments, in particular the tombs of Don Fernando and the Cid, both natives of Burgos, and celebrated throughout Spain for their heroic achievements in the wars with the Moors. There are several other fine churches, but the rest of the public buildings are not deserving of notice. The wool of Old Castile passes principally through Burgos, and it has some woolen manufactures and hat making. Burgos is the see of an archbishop, and at one time contained a university. It was founded about the close of the 9th century as the capital city of the courts of Castile and León and soon became a flourishing city, reaching the height of its prosperity in the 15th century, when it shared with Toledo the prestige of being occupied as a royal residence. It declined rapidly after the removal of the court to Madrid in 1560. To-day, despite its decay, the city is dominated by the grand old cathedral and the personality of the national hero, the Cid Campeador. Pop. about 31,400. The province of Burgos is bounded on the north by Santander, east by Alava, Logroño and Soria, south by Segovia and west by Palencia and Valladolid. The area is 5,650 square miles. Pop. about 340,000.

BURGOYNE, bėr-goin', **John,** English general and dramatist: b. 24 Feb. 1723; d. London, 4 Aug. 1792. He was the son of Capt. John Burgoyne, and grandson of Sir John Burgoyne of Bedfordshire, although reputed to be a natural son of Lord Bingley. Educated at Westminster, he entered the army at an early age, and while a subaltern eloped with Lady Charlotte Stanley, daughter of the Earl of Derby. Soon after his marriage he sold his commission to pay his debts. He then lived abroad for seven years, but entered the army again in 1758 as captain of the Foot Guards. In 1759, as lieutenant-colonel of the Coldstream Guards, he served at Belle Isle. After an election to Parliament in 1761, he served with distinction in Portugal, and was sent to America in 1775. He joined General Gage at Boston, with large reinforcements, and witnessed the battle of Bunker Hill, of which he has left an animated description. After proceeding to Canada as governor, he returned to England, but in 1777 was despatched to take command of that expedition from Canada against the United States, the failure of which so largely contributed to the establishment of American freedom. Indeed, few battles have led in their ultimate influence to results so great as did the surrender of Burgoyne with 5,791 fighting men, well provided with artillery, at Saratoga, to the army of General Gates. On his return home, he was received by the King with marked disfavor. His wife died in 1776. He had several natural children by Susan Caulfield, an opera singer, one of whom was Field Marshal Sir J. F. Burgoyne. Burgoyne did not possess the genius of a great general, and was in many respects utterly inadequate to the tasks imposed upon him, yet no one can read his work written in his own defense, 'State of the Expedition from Canada' (London 1780), without acknowledging his courage, and detecting qualities which in a less exalted station might have been of much service to his country. Disgusted with his treatment by the government, he retired to private life, and devoted his leisure to the production of dramas, some of which, as 'The Maid of the Oaks,' 'The Lord of the Manor,' etc., were highly popular in their day. His best play, 'The Heiress,' has been successful not only in its original tongue, but also in several foreign versions. He was made commander-in-chief in Ireland in 1782, and in 1787 was one of the managers of the impeachment of

Warren Hastings, whose trial lasted through several years after Burgoyne's death. He was buried at Westminster Abbey. (See SARATOGA, BATTLES OF). Consult De Fonblanque, 'Episodes from the Life and Correspondence of Burgoyne' (London 1876); O'Callaghan (editor), 'Orderly Book of Lieutenant General John Burgoyne' (Albany 1860); and Stone, 'Campaign of Lieutenant General Burgoyne' (Albany 1877).

BURGOYNE, SIR **John Fox,** English officer of engineers: b. 24 July 1782; d. 7 Oct. 1871. He was the son of Gen. John Burgoyne; was educated at Eton and at the Royal Military Academy at Woolwich; entered the Royal Engineers in 1798; served at Malta in 1800, in Sicily with General Stewart in 1806, in Egypt in 1807 and in the Peninsula with Sir John Moore and Wellington from 1809 to 1814. He shared in the celebrated retreat on Corunna and was present at all the sieges, generally as first or second in command of the engineers, and at most of the battles of the Peninsular War, in which he was twice wounded. During the War of 1812 he assisted as lieutenant-colonel and chief engineer in the attack on New Orleans. In 1826 he accompanied the army of General Clinton to Portugal in the same capacity. He was appointed chairman of the board of public works in Ireland in 1830 and in 1845 became inspector-general of fortifications in England. He was made a lieutenant-general in 1851, and on the outbreak of the Crimean War was sent to Turkey to provide for the defense of Constantinople. After returning to England he was again sent out to Sebastopol, where he was chief of the engineering department till recalled in 1855. He received the order of the Medjidie from the Sultan of Turkey, was made a general in 1855, the following year was created a baronet, in 1868 a field-marshal and for some years, up to his death, held the appointment of constable of the Tower of London. In 1859 a work was published in London under the title of 'Military Opinions of Gen. Sir J. F. Burgoyne,' in which many of his official writings were collected.

BURGRASS. See SANDBUR.

BURGRAVE (cf. Ger. *Burg,* town, + *Graf,* count, governor), a count who in the Middle Ages had command of a castle or burg. Burgraves were appointed to their office by the Emperor or by the bishops, and belonged to the nobility by virtue of their office, which became hereditary. Their powers differed in different places, but as a rule they were entrusted with keeping the public peace, the oversight of trade and the market, and the command of the troops and the police in their districts. As the free cities grew in power they were separated from the jurisdiction of the burgrave. The office lost its significance in the course of the 13th century, but the title is retained by some princely families to the present day, as, for instance, by the Kings of Prussia, who have the title of Burgrave of Nuremberg.

BURGUNDY, Louis (DUKE OF), Dauphin of France: b. Versailles, 6 Aug. 1682; d. 18 Feb. 1712. He was grandson of Louis XIV and father of Louis XV. A boy of ungovernable passions and temper, great haughtiness of bearing and sensuality of life, he is said to have been much corrected in character and conduct by the influence of his preceptor, the saintly Fénelon. At the age of about 15 he married Princess Adelaide of Savoy; was made generalissimo of the army in 1701, but he failed to show any ability and the result of the unfortunate campaign of 1708 was laid at his door, after which he returned, discredited, to Paris. On the death of his father he became heir-apparent to the throne. He was called the Grand Dauphin. Throwing himself into the party of St. Simon and his old teacher, Fénelon, he boldly advocated liberal measures that would have removed many of the worst evils of the old régime. But before his party had more than barely outlined their scheme, he was stricken with smallpox. With him perished the hopes of the party. His wife died two days previous to his death. His second son became Louis XV of France. Consult St. Simon, 'Memoirs' (Paris 1829–30), and Farmer, 'Versailles and the Court under Louis XV' (New York 1896).

BURGUNDY, a region of western Europe, so called from the Burgundians, a Teutonic people originally from the country between the Oder and the Vistula. In consequence of the wars against the Alamanni, in which they were defeated, they migrated to the region of the upper Rhine and in the beginning of the 5th century they passed over into Gaul, and, as allies of the Romans, after a long struggle obtained possession of the southeastern part of this country. Here they founded a kingdom, which had as its seat of government sometimes Lyons and sometimes Geneva; but having become engaged in a war with the Franks, they were at last wholly subdued in 534. More than one kingdom of Burgundy, so called, subsequently arose, as well as the important county of Burgundy (Upper Burgundy, Franche-Comté); but the most important state of this name was the duchy of Burgundy (Lower Burgundy), consisting principally of the French province Bourgogne (Burgundy, properly so called). The long line of ancient dukes of Burgundy became extinct in 1361 with the death of Duke Philip, and Burgundy was immediately united by King John of France with the French crown. The dignity of Duke of Burgundy was restored in 1363 by his grant of the dukedom to his youngest and favorite son, Philip the Bold (q.v.). In 1368 he married Margaret, the widow of the last Duke Philip of the old line, only daughter and heiress of Louis III, Count of Flanders, and thereby greatly augmented his possessions, which now included Flanders, Mechlin, Antwerp and Franche-Comté. In 1402 he was made regent of France, an appointment which gained him the hatred of the King's brother Louis, Duke of Orleans, and led to the struggle between the Orleanist and the Burgundian factions. In 1404 Philip died and was succeeded by his son, John the Fearless, who was stabbed by the companions of the Dauphin in 1419. His son and successor, Philip the Good (q.v.), gained great accessions of territory, including Hainault, Holland, Zealand, Namur and, in 1431, Brabant and Limburg, which reverted to him from a younger branch of his family. In 1441 he also obtained the duchy of Luxemburg. On his marriage with his third wife, Isabella, daughter of King John of Portugal, he founded the order of the Golden Fleece (1429). His son, Charles the Bold (q.v.), who succeeded him in 1467, became the inveterate enemy of Louis XI of France, and one of the most powerful princes in Europe. He acquired Guelders in 1475, but perished in the fatal battle of Nancy in 1477, leaving behind him a daughter, Maria, the sole heiress of his states. She married Maximilian of Austria, who thus obtained the Netherlands and Upper Burgundy. The King of France received the dukedom of Burgundy, which he assumed as a male fief. Henceforth the territories that had belonged to Charles shared the fortunes either of France or of the empire. In the empire what was called the circle of Burgundy for a time embraced Franche-Comté and the Netherlands. In the Peace of Madrid, in 1526, Francis I was obliged to agree to the cession of the duchy of Burgundy to Charles V of Germany, but the cession was never carried out, and in the Peace of Cambray, in 1529, Charles renounced his claim to it. Franche-Comté was conquered by Louis XIV and retained by him at the Peace of Nimeguen in 1678. After this time the name Burgundy is best known as designating one of the provinces or governments of France. The name is now applied to one of the four departments of Yonne, one of the most productive regions in France. Consult Plancher, U., 'Histoire générale et particulière de Bourgogne' (Dijon 1739–81); John, O., 'Geschichte der Burgundionen' (Halle 1874); Barante, B. de, 'Histoire des ducs de Bourgogne de la maison de Valois' (Paris 1833–36).

BURGUNDY (called also Burgundy Proper or Lower Burgundy), formerly a province in the east of France, lying on the west of Franche-Comté and on the south of Champagne. It now forms the four departments of Yonne, Côte-d'Or, Saône-et-Loire and Ain. It is one of the most productive regions in France. The principal product is wine. See BURGUNDY WINES.

BURGUNDY PITCH, the resinous exudation of the stem of the spruce fir (*Abies excelsa* or *Pinus abies*), melted and strained. It is obtained from Switzerland, but is seldom genuine. It is hard and brittle, opaque, of a dull reddish-brown color, empyreumatic odor and aromatic taste. It gives off no water when heated, is not bitter and is free from vesicles. It consists chiefly of resin and a little volatile oil, whence its odor. The resin resembles that of turpentine. The resin is melted in hot water to remove some of the oil and is then strained through a coarse material. Pitch plaster acts externally as a slight stimulant to the skin. Burgundy pitch enters also into the composition of the iron plaster. It takes its name from Burgundy in France, where it was first prepared. A pitch resembling it can be prepared from common resin and palm oil, which, unlike Burgundy, is non-soluble in glacial acetic acid.

BURGUNDY WINES, famous French wines, deriving their name from the ancient province of Burgundy. They have a reputation superior to their present popularity. They are nevertheless wines of delicious flavor and bouquet. It has been supposed that they would not well bear a sea-voyage, but it is now settled that when transported to America and back, their quality is greatly improved. Burgundy has a medium content of alcohol, acids and solids, is very low in tannin and rather lacking in color. The vineyards, consisting of Pinots, Gamai Noir and Meunier grapes, are located half-way up the hillsides (800–1,000 feet high) in the Côte d'Or, between Dijon and Châlons. Three classes of red Burgundy and two of white are recognized. The most renowned red wines of Burgundy are Romané-Conti, Clos-Vougeôt, Chambertin and Richebourg. Chambertin was the favorite wine of Louis XVI and Napoleon. Chablis, a white wine, has many admirers but is inferior to the best growths of the Garonne and the Rhone.

BURHÁNPUR, boor-han-poor', a town of the Nimar district, Central Provinces, British India, formerly the capital of Khandesh, is situated on the Tapti River about 300 miles northeast of Bombay, 210 miles east of Surat. It is situated on high ground and is well planned and built, with a rampart of brick and a palace of brick, known as the Red Fort, built by Akbar, who adorned the town with marble halls. It has a mosque and other buildings worthy of note, and was once famous for its manufactures of gold and silver brocade, muslin and silks, which still exist to some extent, though the town has long been declining. Pop. 22,777.

BURHEL. See BAHRAL.

BURI, the grandfather of Odin, in Norwegian mythology. According to the legends, 12 streams flowed from the spring Hvergelmir (the roaring cauldron) in Niflheim (the region of shadows), and later in their course were frozen, thus surrounding the region of elemental fire (Muspelheim) with blocks of ice. In the conflict of the ice with the fire, the rime, or frosty snow, was melted and the drops formed the giant Ymir and the cow Audhumla (darkness); from the cow's udder came four streams of milk with which the giant was fed. Audhumla was nourished by licking the salt ice-blocks, and as she licked them a man's hair appeared on the first day, a man's head on the second day and the whole man on the third day; this was Buri. He was of giant size and strength; he had a son Bor through whom he was the grandfather of Odin, Vili and Ve. Consult Anderson, 'Norse Mythology' (Chicago 1901).

BURIAL, the ordinary method of disposing of the dead, a practice which varies among different people. Among savage races, and even among some civilized peoples of the East, exposure to wild animals or birds of prey is not uncommon. The careful embalming of the dead by the ancient Egyptians may be regarded as a special form of burial. But by far the most common forms of disposing of the dead have been burning and interring. Among the Greeks and Romans both forms were practised, though among the latter burning became common only in the later times of the republic. In this form of burial the corpse, after being borne in procession through the streets, was placed upon a pyre built of wood, and profusely sprinkled with oils and perfumes. Fire was set to the wood, and after the process of cremation was complete, the bones and ashes were carefully gathered together by the relatives and placed in an urn. With the introduction of the Christian religion, consecrated places were appropriated for the purpose of general burial, and the Roman custom of providing the sepulchre with a stone and inscription was continued by the Christians. The practice of cremation now declined and finally disappeared, but has recently to some extent been revived. See Burying-Places; Cremation; Funeral Rites; Mound Builders; Mummy.

BURIAN VON RAJECZ, Baron Stefan, Austro-Hungarian diplomat and statesman: b. near Pressburg, Hungary, 15 Jan. 1851, a Hungarian of Slovak extraction. Educated in his native town and Vienna, he served in various consular capacities at Alexandria, Bucharest, Belgrade, Sofia and Stuttgart. As Austro-Hungarian Consul-General at Moscow, he acquired a thorough knowledge of the Russian language and country; later, as Ambassador to Greece, he became intimately acquainted with the complexities of Balkan politics. He was also for a time Finance Minister of the Dual Monarchy, and in 1903 succeeded von Kallay as chief administrator of Bosnia-Herzegovina, in which office he came into close touch with the vexed southern Slav question. On the resignation of Count Berchtold, the Austro-Hungarian Foreign Minister, in January 1915, Baron von Burian, known as a man of conciliatory temperament and firm character, in addition to his wide experience, was called to succeed him. His appointment at that juncture was regarded as evidence of a desire to make some political changes at a moment when affairs had become extremely critical. The policy of Count Berchtold (q.v.) had precipitated the great war; and Berchtold was now involved in a diplomatic duel with Baron Sonnino (q.v.), the Italian Foreign Minister, over the interpretation of Article VII of the Triple Alliance (q.v.), on the strength of which Italy demanded certain territorial concessions. It was believed that Baron Burian would be more disposed than Count Berchtold to make the sacrifices necessary to assure a continuance of Italian neutrality. Almost from the beginning, however, he declared the cession of territory to be impossible, though he afterward agreed, on the advice of Germany, to cede almost the whole of the Italian-speaking territory of Austria. The only important Italian demand he rejected was the cession of certain islands along the Dalmatian coast. The negotiations, at which Prince Buelow assisted in Rome, broke down owing to the inflexible demand of Baron Sonnino that the transfer be effected immediately and not, as was proposed, after the end of the war. Italy declared war on Austria-Hungary, 23 May 1915. The undiplomatic activity of the Austrian Ambassador to the United States, Dr. Dumba (q.v.), was revealed by the British seizure of a private letter addressed by him to Baron Burian, and resulted in the Ambassador's dismissal. In the *Ancona* and *Arabic* (q.v.) controversies with the American governmen, Baron Burian experienced further diplomatic reverses. Reports of his resignation were current on several occasions, the first appearing a few days after his acceptance of office.

BURIATS, boo'rē-ats, a Mongolian people, numbering some 300,000 who were conquered by the Russians in 1664 and have since developed the peaceful arts. They resemble the Chinese in appearance and dress, the men still retaining the queue. They inhabit the southern part of Irkutsk and the trans-Baikal territory. Their principal occupation is the breeding and rearing of cattle and horses, the latter being especially famous for their endurance and for the masters' attachment to them. They are good agriculturists, being adept at manuring and irrigation, and are also clever fishers and trappers. They are active in the mechanical arts. Their religion is partly Buddhistic, with a Khambo Lama at their head who resides at the Goose Lake; partly Shamanistic with headquarters at the river Angar; and some thousands near Lake Baikal have been converted to Christianity. They have three dialects of their own, and some literature. Many are educated. Consult Melinkoff, Dr. N., 'Internationales Archiv für Ethnographie' (1899); Gmelin, 'Siberia'; Howorth, Sir H. H., 'History of the Mongols' (1876–88).

BURIDAN, bü-rē-däṅ, **Jean,** French scholastic philosopher: b. Béthune, Artois, about 1300; d. after 1358. He studied at Paris, where he attached himself as a disciple of Occam to the party of the Nominalists, and at a later time became himself a teacher. In the end he was forced by his opponents to flee from Paris, when he betook himself to Vienna, where he is said to have been influential in bringing about the establishment of the university. Here also he wrote some logical and ethical treatises, in which he appears as a zealous adherent of the Aristotelian philosophy. Buridan was a supporter of the doctrine of Determinism (q.v.), and he is now chiefly known through having his name attached to an illustration that he is said to have used in support of his views, and known as «Buridan's Ass.» He is said to have supposed the case of a hungry ass placed at an equal distance from two equally attractive bundles of hay, and to have asserted that in the supposed case the ass must inevitably perish from hunger, there being nothing to determine him to prefer the one bundle to the other. This illustration, however, is not found in any of his works, and from its nature it would appear more likely to have been used by the assailants of the doctrine of Determinism. He wrote 'Compendium Logicæ' (1489); 'In Aristotelis Metaphysica' (1518); 'Quæstiones in Decem Libros Ethicorum Aristotelis' (1489). Consult Prantl, 'Geschichte der Logik' (Vol. IV, Leipzig 1855–70); Townsend, 'Great Schoolmen of the Middle Ages' (New York 1905), and Rickaby, 'Scholasticism' (London 1908).

BURIN, or **BRAVER,** the principal instrument used in copper engraving, is made of tempered steel, and is of prismatic form, the graving end being ground off obliquely to a sharp point. The distinctive style of a master is frequently described by such expressions as a soft burin, a graphic burin, a brilliant burin, etc. It is fixed in a handle, the end of which is rounded to fit the hand. Pushed forward by the hand it cuts a shallow or deep furrow, according to the pressure exerted. When in etching, bitten lines or lines with the dry point are imperfect or weak, the burin is used to repair or strengthen them.

BURITI, bu-rī-tē', **PALM**, a lofty, fan-leaved palm (*Mauritia vinifera*), common in swamps in northern Brazil. It bears abundant crops of scaly nuts about two inches long, from the reddish oily pulp of which a confection is made by boiling with sugar. The nuts also yield an oil which is emulsified to make a popular drink. After the tree is felled numerous cuplike holes are made in the prostrate trunk. These become filled with a reddish fluid, which is used as a beverage. Its taste resembles some sweet wines.

BURKE, Edmund, political philosopher and orator: b. Dublin, 12 Jan. (probably) 1729; d. Beaconsfield, England, 9 July 1797. He was the son of a solicitor in good practice. His mother was a Roman Catholic, but he and his two brothers adopted the religion of their Protestant father. Always, however, he was tolerant of Catholicism. At the age of 14 he entered Trinity College, Dublin, where he took his bachelor's degree in 1748. In this period, as his letters show, he had fits of enthusiasm over various studies — a *furor mathematicus*, succeeded by a *furor logicus*, a *furor historicus* and a *furor poeticus*. The 17 years between 1748 and 1765, when his career was finally determined by his election to Parliament, he spent in different employments. Going to London with the intention of taking up law, he succumbed to the attractions of literature and philosophy. He traveled in England and on the Continent, frequented debating clubs and theatres and did more or less hack work for publishers. He printed nothing, however, with which his name is connected till the two books of 1756: 'A Vindication of Natural Society' and 'A Philosophical Inquiry into the Origin of Our Ideas on the Sublime and Beautiful.' In the first he attempted to refute Bolingbroke's arguments against revealed religion by showing that they might be urged with equal force against the organization of society. In the second he took up a subject much discussed at the time; and though his speculations have been superseded, he has the credit of stimulating Lessing to the production of 'Laokoon.' Burke also wrote or helped to write an 'Account of the European Settlements in America' (1757), and an 'Abridgment of the History of England' (1758). In 1759 he began to edit the *Annual Register*, with which he was connected for 30 years. In 1761 he went to Ireland, attached in some indefinite way to William Gerard Hamilton —«Single-speech» Hamilton — who was secretary to the lord-lieutenant. After two years in Dublin he returned to England; there he joined the famous Literary Club, with which are associated the names of Johnson, Goldsmith, Sir Joshua Reynolds and Garrick.

In recognition of his abilities and of the knowledge of politics which he had shown in the *Annual Register*, he was offered the post of private secretary to Lord Rockingham when the latter became Prime Minister in 1765. In the same year he was elected member of Parliament from Wendover. Within a week or two he made a strong impression with two speeches for the repeal of the Stamp Act. Upon the fall of the Rockingham ministry, Burke, who might have had a place with the new administration, remained with his friends. Turning to their account his literary powers, he began his series of great political tracts. In 1769 he put forth 'Observations on the Present State of the Nation,' a reply to a pamphlet by George Grenville. In this controversy Burke showed himself a master of the details of revenue and finance. At this time he took part in some transactions which afforded his enemies a handle against him. Though he had been living almost from hand to mouth till he entered Parliament, he bought in 1768 an estate worth upwards of $100,000. The underlying facts have never been determined with complete satisfaction. This much, however, is clear: Burke lived on terms of intimacy with his brother Richard and a distant kinsman, William Burke. Richard and William, together with Lord Verney, a political patron of Edmund, speculated in stock of the East India Company, and later Richard was engaged in questionable dealings in West Indian lands. That these ventures were shared by Burke has been charged but never proved. On the other hand it can be shown that most of the money for the purchase of his estate he borrowed from Lord Rockingham. After getting the place, he had to borrow right and left to maintain it. Probably his faults were neither dishonesty in speculation nor venality in Parliament, but undue ambition to live as he thought became his position, carelessness and improvidence, and adherence to 18th century standards of propriety, which in such matters were lower than ours.

Whatever his shortcomings in managing his private affairs, his services to the public were very great. He was on the side of the people in the long contest over John Wilkes. Since his sentiments on this subject were in general those of the 'Letters' of Junius, he was suspected of being Junius. This accusation he denied; and his 'Thoughts on the Cause of the Present Discontents' (1770) showed so many differences on minor points that — were no other evidence available — it must be concluded that Burke was not Junius. In the 'Thoughts' Burke argued that the King and a small knot of advisers were building up power for themselves; that powers of government are held in trust for the people; and that popular impatience must therefore be indulged. But, true to his conservative instincts, he would not accept the radical reforms commonly proposed — universal suffrage and the disfranchisement of «rotten boroughs.» He would have changes more gradual. During the years immediately following 1770 Burke devoted his energies to keeping the Rockingham Whigs united against the efforts of the King to win them over. Without Burke, says John Morley, «the Rockingham connection would undoubtedly have fallen to ruin, and with it the most upright, consistent and disinterested body of men then in public life.»

From his political activity Burke withdrew for a time in 1773 for a trip to France. There he observed two things which he strongly dreaded: atheism and an eager questioning of the «allowed opinions which contribute so much to the public tranquillity.» This atheism and speculation, he perceived — and he was one of the few who were so clear-sighted — were working toward revolution. His fear of these tendencies he expressed in Parliament not long after his return.

By this time Burke had won a substantial reputation throughout the United Kingdom. Indeed, as early as 1766 at least one Irish municipality had voted him the freedom of the city; and in succeeding years English mercantile organizations passed resolutions commending his labors in behalf of commerce. Finally in 1774, when troubles with America were thickening, Bristol, the trading centre of the west of England, a city which had everything to lose and nothing to gain from a war with the colonies, elected him to Parliament. At the conclusion of the poll his colleagues had promised obedience to the instructions of his constituents. Burke, however, declared his independence: «Your representative owes you, not his industry only but his judgment; and he betrays you instead of serving you if he sacrifices it to your opinion.» To this declaration he adhered when in 1778 a bill was proposed relaxing restrictions upon Irish commerce. The English merchants, including those of Bristol, protested; but Burke replied, «England and Ireland may flourish together. The world is large enough for us both. Let it be our care not to make ourselves too little for it.» (‹Two letters to Gentlemen in Bristol›). For this liberality Burke was never forgiven, and in the election of 1780 he was forced to seek a new constituency.

It was during his six years as member for Bristol that, in the contest over America, he rose to his full height as a statesman. He was almost alone among the speech-makers of that time in always going below the superficial considerations of the moment to the fundamental fact that in the long run restraint and violence defeat themselves. In addition to many minor speeches scattered through the ‹Parliamentary History,› he made three great contributions to the subject — ‹Speech on American Taxation,› 19 April 1774; ‹Speech on Conciliation,› 22 March 1775, and ‹Letter to the Sheriffs of Bristol,› 3 April 1777. In the first he argued that the tea duty was of no use to England for revenue; that it served only to irritate the Americans, and that by winning the loyalty of the colonists England would get more than she could ever take by force. In the second speech Burke maintained that England must conciliate, and that the only way was by yielding. In the ‹Letter› he reviewed the struggle and in the light of events justified his own position. Of the three pieces that on ‹Conciliation› is the best. Not even when dealing with India does Burke excel in grasp of details, in lucid presentation of a large mass of facts, and in ripened political wisdom. Then, too, he saw what so many failed to observe, that the real cause of the contest lay deeper than the casual orders of a governor or the retaliation of a mob, and that America, in resisting the encroachments of royal prerogative, was fighting a battle for the liberties of Englishmen at home.

Though Burke could not win over Parliament to his views on America, he had better success with his ‹Speech on the Plan for Economical Reform› (1780). People were staggering under the debt from the American war and agitating for a general reform of Parliament. Burke opposed such radical changes; he proposed to abolish some offices, consolidate others and reduce salaries. One of the offices which he reformed, that of paymaster of the forces, he himself occupied in 1782. At that time the North ministry yielded to the Whigs, who were temporarily united under Lord Rockingham, Charles James Fox and Lord Shelburne. Burke, owing in part to infirmities of his temper and the suspicions against him, got only this third-rate position, instead of a place in the cabinet. The Whigs were scarcely in their seats when Lord Rockingham died and Lord Shelburne became head of the administration. At once Fox and Burke refused to work with him, and by joining their old enemy, Lord North, in what is known as the Coalition, they broke up the Whig party. Burke is accused of deserting his principles for purely personal motives. His conduct is hard to defend, for he attacked Shelburne with asperity, and under the Coalition resumed for a few months the office of paymaster.

Against this dubious course we may set his strenuous advocacy of reform in India. That country was victim of the corrupt and cruel system of the East India Company. Burke was familiar with the subject, for he had been a member of select committees on Indian affairs and had drawn two important reports. He is also supposed to have framed the East India bill commonly known as Fox's. At any rate he defended it, 1 Dec. 1783, in one of his best speeches. The bill, however, was defeated and the Coalition, which supported it, driven from office. Early in 1785 Burke renewed the attack in his ‹Speech on the Nabob of Arcot's Debts› — a preliminary to the proceedings against Warren Hastings. In 1786 Burke drew the articles against Hastings. The trial dragged on till 1795, and though the verdict at last was for acquitttal, Burke had none the less succeeded in reforming the government of India; for he had trumpeted the wrongs of that «emptied and emboweled» land till public sentiment would no longer tolerate them.

Before the trial of Hastings had closed, the French Revolution had broken out. Burke looked upon it, not as the emancipation of oppressed masses, but as an effort of atheists and political theorists to uproot the settled order. Since his views were hostile to those of the more radical Whigs, he began to draw away from the men with whom he had been allied against the encroachments of the Crown in England and America. In 1790 he widened the breach still further by aggressive proclamation of his opinions in ‹Reflections on the Revolution in France.› The book had for that day an enormous sale and divided Great Britain into two parties — one composed of Burke and an uncongenial company of Tories; the other of Liberals, many of whom had been Burke's lifelong associates. Burke himself violently quarreled with his old friend Fox. The seeming contradiction between his early position and his later is accounted for in part by the fact that he grew more conservative with age, in part by his desire to preserve the balance between monarch and subject. In England the Crown had been the aggressor; in France, he thought, the people. Moreover, he had always insisted that liberty is «inseparable from order»; and in France he saw nothing but disorder. As the Revolution progressed, Burke became more and more wrought up, so that in each of his succeeding utterances — ‹Letter to a Member of the National Assembly› (1791), ‹Appeal from the New to the Old Whigs' (1791), 'Thoughts on French Affairs' (1791), 'Remarks on the Policy of the Allies' (1793), 'Observations on the Conduct of the Minority' (1793) and 'Letters on a Regicide Peace' (1796)—the reasoning grew feebler, the scolding shriller.

During the same period, when Burke was dealing with a subject on which he was more thoroughly informed, Ireland, he showed his old qualities of statesmanship. He had always been a champion of his down-trodden native land. When Ireland caught the contagion of the French Revolution, and when the war between England and France made Ireland still more restless, Burke urged for Ireland the same policy of conciliation that he had urged for America. In letter and pamphlet he unceasingly advocated relieving the Catholics of their political disabilities.

In 1794 he retired from Parliament. He was to have received a peerage with the title Lord Beaconsfield; but since the death of his son left him without direct male heir, he accepted instead a pension. This was the occasion of a fresh attack upon him by his enemies. He replied effectively in the 'Letter to a Noble Lord' (1796).

His zeal in behalf of the wretched and the oppressed was not a mere vague sentiment; it was a motive in his daily conduct. When the poet Crabbe was obscure and penniless, Burke took him into the family, found a printer for his verses and finally obtained for him a living in the Church. At the time of the Revolution, Burke also kept open house for French refugees and established a school for their children. Burke's principles of statesmanship, when briefly set down, seem very bald and simple. The basis of his system is explained in a sentence from one of his letters: «The principles of politics are those of morality enlarged.» The first of the moral laws upon which he rested great weight was justice; the second, generosity. Knowing that perfect justice could never be obtained, that human institutions are at best compromises, he was not a theorist; he did not fall into the fallacy that the machinery of government may be constructed as if men were uniform, passive units. These phases of his bent for the practical are in the last analysis a trust in experience. A man who clings so tenaciously to experience is likely to be an uncompromising conservative; and Burke was, for his generation and all generations since, the «great pleader for conservatism.» As an orator he frequently produced no immediate effect. His gestures were clumsy, and when he spoke in public his voice was somewhat harsh, he dropped into a strong Irish brogue and, at times, a hurried articulation. But, above all, he overestimated the capacity of his hearers. Not content with a concise presentation of leading points, he insisted on applying profound philosophic principles. Yet some of his speeches, notably at the trial of Warren Hastings, produced a profound effect. This effect was largely due to the vigor of his style as a writer. He was virile, vivid in description and unsurpassed in lucid and logical arrangement of material.

In the winter of 1756–57 he married Jane Nugent, daughter of a physician. Her capacity for management lifted many burdens from his shoulders. His only child, a son, Richard, died in 1794.

Among his important writings or speeches not already mentioned are 'Address to the King' (1777); 'Letter to Sir Hercules Langrishe' (1792); 'Thoughts and Details on Scarcity' (1795). See Reflections on the French Revolution; On Conciliation with the Colonies; On The Sublime and Beautiful.

Bibliography.— There are in the market three or four editions of Burke's writings and speeches, substantially complete. The best short life is in the 'Dictionary of National Biography.' John Morley's 'Life of Burke' (in the 'English Men of Letters,' 1879) is excellent; also his 'Burke, a Historical Study' (1867). Of the earlier lives, James Prior's (2d ed., 1826) is the best. Of course Burke bulks large in the standard histories and memoirs of England in the 18th century.

Hammond Lamont,
Editor New York Nation; Editor 'Burke's Speech on Conciliation with America.'

BURKE, Jane, better known as Calamity Jane, American army scout and mail carrier: b. Princeton, Mo., 1852; d. Deadwood, S. D., 1 Aug. 1903. She was reared on the plains and early became an Indian scout and was an aide to General Custer and General Miles in numerous campaigns. For several years she was the government mail carrier between Deadwood, S. D., and Custer, Mont.

BURKE, John, Irish genealogist: b. near Parsonstown, Ireland, 1786; d. Aix-la-Chapelle, 27 March 1848. His life was devoted to genealogical research. In 1826 he began to publish a 'Genealogical and Heraldic Dictionary of the Peerage and Baronetage of the British Empire' and subsequent works by him were 'A Genealogical and Heraldic History of the Commoners of Great Britain and Ireland' (1833–38), which in subsequent editions appeared as 'A Dictionary of the Landed Gentry.'

BURKE, John, State governor and national treasurer: b. Keokuk County, Iowa, 25 Feb. 1859. He studied at the University of Iowa, receiving the LL.B. degree in 1886, when he removed to North Dakota and was county judge during several years of Rolette County. After being elected member of the North Dakota House of Representatives (1891–93) and State Senator (1893–95), in 1906, 1908 and 1910, on three occasions, he was elected Democratic Governor of North Dakota. President Wilson in 1913 appointed him Treasurer of the United States.

BURKE, Sir John Bernard, English herald and genealogist, son of John Burke (q.v.): b. London 1815; d. Dublin, 13 Dec. 1892. He was educated at Caen in Normandy, was trained as a lawyer and called to the bar in 1839. Besides editing the successive issues of the 'Peerage' founded by his father (49th ed., 1887), he published other works on the 'Landed Gentry' (1846); 'Extinct Peerages' (1846); 'Anecdotes of the Aristocracy' (1849); 'Family Romance' (1853); 'The Vicissitudes of Great Families' (1859); 'The Rise of Great Families' (1873); 'The Book of Precedence' (1881); and 'Reminiscences' (1882).

BURKE, Maurice Francis, American clergyman: b. Ireland, 5 May 1845. He came to the United States in childhood and was educated in

Chicago and Notre Dame, Ind., and in the American College, Rome, where he was ordained to the Roman Catholic priesthood in 1875. Returning to the United States, he took charge of a parish in Joliet, Ill. (1878–87). In 1887 he was consecrated bishop of Cheyenne, Wyo., and in 1893 was transferred to the see of Saint Joseph, Mo. Bishop Burke is known as a fine linguist.

BURKE, Robert O'Hara, Australian explorer: b. County Galway, Ireland, 1820; d. Australia, 28 June 1861. After serving in the Austrian army he went to Australia, and after seven years' service as inspector of police was appointed commander of an expedition to cross the continent of Australia from south to north. He and his associate, Wills, reached the tidal waters of the Flinders River, but both perished of starvation on the return journey. They were among the very first white men to cross the Australian continent from south to north.

BURKE, Thomas, American statesman: b. Ireland, about 1747; d. Hillsborough, N. C., 2 Dec. 1783. He left Ireland about 1764 and lived for some years in Accomac County, Va., engaged in the study and practice of medicine. He next studied law, began practice in Norfolk and in 1774 removed to Hillsborough, N. C. Of a bold and impetuous temper, a ready writer and speaker, he became one of the leading spirits in the Revolutionary struggle. While he was in Virginia, his writings in opposition to the Stamp Act had brought him into notice, and he had a large share in the formation of the constitution of North Carolina. He was a member of the provincial congress at Halifax in 1776 and a volunteer at the battle of Brandywine. He was a member of Congress from December 1776 to 1781, when he was chosen first governor of North Carolina under the new constitution. In September of that year he was surprised and seized by the Tories and retained at James Island, S. C., as a prisoner on parole. Obnoxious to the Tories from his previous course, he was in daily apprehension of assassination, to escape which, after endeavoring unsuccessfully to obtain an exchange or a parole to some other State, he effected his escape in the night of 16 Jan. 1782, after an imprisonment of four months. In a letter to General Leslie, Burke gave his reasons for withdrawing and said that he still considered himself subject to the disposal of the British authorities. He was regularly exchanged soon afterward and resumed his duties as governor, but was defeated the following year, when a candidate for re-election, it being urged that he had violated his parole.

BURKE, Thomas Martin Aloysius, American clergyman: b. Ireland, 10 Jan. 1840; d. 20 Jan. 1915. He came in childhood to Utica, N. Y., and was educated at the College of Saint Michael, Toronto, and at Saint Mary's Seminary, Baltimore, and was ordained to the Roman Catholic priesthood in 1864. He was appointed to labor in Albany and became successively vicar-general and administrator. In 1894 he was consecrated bishop of Albany.

BURKE, Thomas Nicholas, Irish clergyman and orator: b. Galway 1830; d. 1883. He was educated in Italy, where he entered the Order of Saint Dominic. Going to England, he preached in that country and later in Ireland, gaining a high reputation as an orator and becoming familiarly known as "Father Tom." In 1872 he made a visit to the United States and lectured in reply to Froude, his addresses appearing in print under the title of 'English Misrule in Ireland.'

BURKE AND HARE, two miscreants, of whom William Burke, a native of Ireland, was detected, tried and executed at Edinburgh, in 1829, for the murder of numerous individuals, his accomplice, Hare, escaping the hangman by turning king's evidence. At this time the "resurrectionists" were busy at their nefarious trade, but the vigilance with which the burying-grounds throughout the country were watched rendered a supply of subjects for anatomical schools almost impracticable, and the demand for dead bodies consequently became great. This led Burke and Hare to murder, by suffocation, many poor waifs who were decoyed into Hare's lodging-house, and whose bodies they sold to Dr. Robert Knox, proprietor of an anatomical theatre in Edinburgh. The case of Burke and Hare brought home to the public mind more clearly than ever before how necessary it is that schools of anatomy should receive a regular supply of subjects for dissection, and in 1832 an act was passed for supplying the anatomical schools throughout the kingdom from the unclaimed dead in the hospitals.

BURKEL, bür'kĕl, **Heinrich,** German painter: b. Pirmasens, 30 March 1813; d. Munich, 10 June 1869. He was educated at Munich and in Italy; he is chiefly a genre painter; his scenes from the Bavarian and Tyrolean Alps were among the first of their kind, and his village and tavern scenes rank among the best in modern art. Among his paintings are 'Scenes in an Inn' and 'Winter Scenes in the Tyrol.'

BURKITT, Francis Crawford, English Biblical scholar: b. London, 3 Sept. 1864. He was graduated at Trinity College, Cambridge, was lecturer in palæography at Cambridge University 1904–05, and since 1905 has been Norrisian professor of divinity at the same institution. He has published 'Early Christianity Outside the Roman Empire' (1899); 'Fragments of Aquila' (1897); 'The Rules of Tyconius' (1894); 'Two Lectures on the Gospels' (1900); 'Early Eastern Christianity' (1904); 'The Gospel History and Its Transmission' (1906); 'Earliest Sources for the Life of Jesus' (1910); 'The Failure of Liberal Christianity' (1910); 'Jewish and Christian Apocalypses' (1914).

BURLEIGH, bĕr'lā, **Bennet,** war correspondent: b. Glasgow, Scotland, 1841; d. 17 June 1914. He fought in the American Civil War, during which he was twice condemned to be shot. As war correspondent he served in the Egyptian campaign of 1882, in the Sudan, Madagascar, Ashanti, South Africa, the Russo-Japanese War, Tripolitan War and the Bulgarian War of 1912–13. He was the author of 'Two Campaigns' and 'The Empire of the East' (1905).

BURLEIGH, Edwin Chick, United States Senator: b. Linneus, Me., 27 Nov. 1843. A student of Houlton Academy, he became State land agent and assistant clerk in the Maine House of Representatives 1876–78, clerk in the office of the State treasurer in 1880 and treasurer in 1884. He was elected Governor of Maine 1889–92; member of Congress 1897–1911; and United States senator 1913–19.

BURLEIGH, George Shepard, American writer, brother of William H. Burleigh: b Plainfield, Conn., 25 March 1821; d. Providence, R. I., 21 July 1903. He has published 'The Maniac and Other Poems'; 'Signal Fires on the Trail of the Pathfinder'; a metrical romance in six cantos, several dramas and a very considerable volume of fugitive poetry which appeared in newspapers and magazines for half a century. His work is characterized by simplicity, naturalness and forcefulness; but it is very uneven in quality, though generally euphonic. Burleigh early developed a facility in verse which gained for him distinction in his native State where he was known as the farmer poet. He received only such education as the district school afforded in the winter months, and he continued to work on the farm until middle life. All his spare time was given to literary pursuits from his boyhood days.

BURLEIGH, William Cecil (LORD), English statesman: b. Bourn, Lincolnshire, 13 Sept. 1520; d. London, 4 Aug. 1598. He was Secretary of State under Edward VI and Elizabeth, and Prime Minister of England for 40 years. In 1588 Parliament was assembled, and, by his advice, a plan of religious reform was laid before it. In this he had a considerable share; and he also took the leading part in the establishment of the Thirty-nine Articles of faith which form the basis of the reformed religion of the state. To him is also due the regulations of the coinage, which had been altered since Henry VIII's time. He was created Baron Burleigh, in 1571, and in 1588 concluded an advantageous treaty with the Netherlands. His policy was both cautious and comprehensive and he was unaffected by personal prejudices in his management of public affairs. Consult Nares, 'Memoirs of Lord Burghley' (1828–31); Charlton, 'Life' (1847); Hume, 'Great Lord Burleigh' (1898).

BURLESON, Albert Sidney, United States Postmaster-General: b. San Marcos, Tex., 7 June 1863. A graduate in 1884 of the University of Texas, he became a lawyer, and was assistant city attorney of Austin, and attorney of the 26th judicial district of Texas during several years. From 1899 he was several times elected member of Congress, and in 1913 was appointed Postmaster-General by President Wilson.

BURLESQUE, the comic effect arising from a ludicrous mixture of things high and low. High thoughts, for instance, are clothed in low expressions, or noble subjects described in a familiar manner, or vice-versa.

BURLEY, Bennett G., Confederate naval officer. On 19 Sept. 1864, assisted by Acting-Master John Y. Beall and others, he captured the steamer *Philo Parsons,* plying between Detroit and Sandusky, when about two miles from Kelly's Island, off the Ohio Coast. Subsequently another American steamer, the *Island Queen,* was captured by Burley and his party, and after her passengers, including 25 United States soldiers, had been made prisoners and transferred to the *Philo Parsons,* the *Island Queen* was taken out into the lake and sunk. The *Philo Parsons* was afterward taken to Sandwich, on the Canadian shore, and left there. Burley was arrested, and the evidence produced at the extradition trial at Toronto in his case rendered it manifest that he was acting under the orders of the Southern Confederacy in the capture of the steamers, and that the immediate object was the capture of the United States war-vessel *Michigan,* guarding Johnson's Island; and the ultimate object the taking of Johnson's Island and the liberation of the 3,000 Confederate soldiers there imprisoned. That all this was not attempted by Burley and his comrades was probably owing to the fact of his discovery of the hazardous and seemingly impossible character of the undertaking after he had captured the two steamers. After some diplomatic correspondence between the British government and that of the United States, Burley was surrendered to the authorities of the latter, under the provisions of the extradition treaty, the plea of "belligerent rights" in his behalf by Jefferson Davis not being regarded by the court as sufficient to free him from the crime of robbery charged against him in the indictment.

BURLINGAME, Anson, American diplomatist: b. New Berlin, N. Y., 14 Nov. 1822; d. Saint Petersburg, Russia, 23 Feb. 1870. After he was graduated from Harvard Law School in 1847 he practised law in Boston, and entering politics was active as a Free Soil advocate in 1848, and in 1854 was sent to Congress as a representative of the American party. His vigorous denunciation of the assault upon Senator Sumner by Preston Brooks brought him a challenge from the latter, which was accepted, but Brooks declined to travel to the rendezvous in Canada. In 1861 he was sent as Minister to Austria but was not received by the Austrian government on account of his advocacy of Hungarian independence. He was Minister to China 1861–67, and in the last-named year was appointed Ambassador from China to the United States and various European governments. On 4 July 1868 he concluded the noted 'Burlingame Treaty' which gave reciprocal privileges to China and the United States and was the first acceptance by China of the principles of international law. After concluding treaties between China and Denmark, Sweden, Holland and Prussia, he died while arranging a treaty between China and Russia. Consult Williams, 'Anson Burlingame, and the First Chinese Mission to Foreign Powers' (New York 1912).

BURLINGAME, Edward Livermore, an American editor, son of Anson Burlingame (q.v.): b. Boston, 30 May 1848. He studied at Harvard and Heidelberg and later acted as private secretary to his father, who was United States Minister to China. Since 1879 he has been associated with the publishing house of Charles Scribner's Sons, and from 1886 to 1914 was editor of *Scribner's Magazine.* He has received the degrees Hon. A.M., Harvard, 1901; Litt.D., Columbia, 1914.

BURLINGAME, Cal., city in San Mateo County, situated on a peninsula, 20 miles south of San Francisco, on the Southern Pacific and the United of San Francisco railroads. It is well built, has two grammar schools, a city hall and a public library, four churches, banks, a weekly newspaper. Its enterprises are of the kind that supply the wants of the immediate territory in which they are situated. The city is a favorite residential suburb of San Francisco. It is progressive in the matter of improvements, with miles of permanently paved streets and walks, well-lighted, and with a municipal water plant. Pop. 3,500.

BURLINGTON, England. See BRIDLINGTON.

BURLINGTON, Iowa, city and county-seat of Des Moines County, 206 miles west-southwest of Chicago on the west bank of the Mississippi River at the intersection of the Chicago, Burlington and Quincy, the Chicago, Rock Island, and Pacific, the Muscatine North and South and the Toledo, Peoria, and Western railroads. Burlington, sometimes called the «Orchard City,» occupies a natural amphitheatre, formed by the limestone bluffs that slope back from the river, and on which many of the residences are built. The river here is broad and deep and is spanned by a railroad bridge. The city is connected by steamboat lines with important points on the Mississippi, and its river commerce is of considerable importance. The industries include the manufacture of agricultural tools, pearl buttons, wheels, desks, furniture, screens, boilers, mattresses, soap, flour, candy, burial caskets, Corliss engines, sleigh bells, novelties and the quarrying of limestone found in the vicinity. The extensive machine and repair shops of the Chicago, Burlington and Quincy Railroad are located here. The city contains among its important buildings an opera house, courthouse, public library, hospitals, schools of various kinds and the Burlington College of Commerce. Crapo Park, of 100 acres, is in the southern part of the city and is noted for its beauty. The city is governed by a mayor, elected for two years, and a city council, which has the power of appointment to all city offices (the commission form of government). It was named for Burlington, Vt., by its first settlers. A fur trading post was established there in 1829; its earliest buildings were erected in 1833, and it was the State capital, 1837–40. It was incorporated in 1837 and received its city charter in 1838. Pop. 24,800.

BURLINGTON, Kan., city and county-seat of Coffey County, 60 miles south of Topeka, on the Atchison, Topeka and Santa Fe, and Missouri, Kansas and Texas railroads, on the Neosho River. It has extensive agricultural and stock-raising interests; is in a district rich in natural gas, and contains grain elevators, flouring mills, cigar factories and manufactories of electric appliances, tiles and carriages, and a Carnegie library. Pop. 2,180.

BURLINGTON, N. J., city and port of entry in Burlington County, on the Delaware River and the Pennsylvania Railroad, 18 miles northeast of Philadelphia. It is a manufacturing trade centre for surrounding towns, and contains Saint Mary's Church, endowed by Queen Anne; Saint Mary's Hall, the oldest Church school for girls in the country; the State Masonic Home; Burlington College, and many fine old residences; and has manufactories of shoes, stoves, iron pipe, canned goods, silk, hollowware, braid, typewriter ribbons and carbon paper, carriages and structural iron. There is a national bank and a trust company, with combined resources amounting to $2,356,959. The value of taxable property is $3,866,201; of school property and equipment $137,200; and of public buildings and equipment $344,888. Burlington is governed, under a charter of 1851 (revised in 1868), by a common council of 12 members. In 1915 the government receipts amounted to $116,393, expenditures to $94,559. The city was settled in 1677, by Friends, under the name of New Beverly. The name was subsequently changed to Bridlington, in honor of the Yorkshire town of that name on the North Sea, commonly called Burlington, and the spelling was presently made to accord with the pronunciation. The city was for many years the seat of government of West Jersey; and was the residence of the last colonial governor, William Franklin. It was bombarded by the British in 1776 and again in 1778. Pop. 9,504. Consult Stackhouse, A. M., ‹Retrospect of Colonial Times in Burlington County› (Moorestown, N. J., 1906); Woodward, E. M., ‹History of Burlington and Mercer Counties, N. J.› (Philadelphia 1883).

BURLINGTON, N. C., city in Alamance County, 20 miles east of Greensboro, on the Southern Railroad. It contains casket factories, hosiery and overalls establishments, manufactures steel bridges and has extensive cotton interests. Settled in 1850 Burlington was incorporated in 1866. The government is vested in a mayor and council, the former being chosen for a term of two years. The city owns the waterworks. Pop. 4,808.

BURLINGTON, Vt., city, port of entry and county-seat of Chittenden County, on Lake Champlain and the Central Vermont and Rutland railroads, 40 miles northwest of Montpelier. It has a very large lake commerce and manufactories of lumber, cotton and woolen goods, furniture, boxes, refrigerators, brushes, paper, toys, medicines and iron. In the neighborhood are large quarries of marble and limestone. The environment is agricultural. The city is the seat of the State University of Vermont and of the State Agricultural and Medical colleges; Bishop Hopkins Hall; the Roman Catholic Cathedral; the Fletcher, Billings and Burlington Law Libraries, a county courthouse, United States government building and a Young Men's Christian Association hall. Burlington is noted for its benevolent and educational institutions, which include the Mary Fletcher Hospital, Home for Aged Women, Home for Friendless Women, Home for Destitute Children, Adams Mission House, Louisa Howard Mission, Providence Orphan Asylum, Cancer Relief Association, Lake View Retreat, several sanitariums, the Vermont Episcopal Institute, Saint Joseph's and Saint Mary's academies (Roman Catholic) and high and graded schools. The city was settled in 1763, was a garrisoned post during the War of 1812 and was incorporated in 1865. It is governed by a mayor, elected for two years, a council and a board of aldermen. The waterworks and electric-lighting plants are the property of the city. Its material development has been largely due to its great lumbering industries. The famous Col. Ethan Allen is buried beneath a handsome monument in

Greenmount Cemetery. Pop. (1910) 20,468. Consult Allen, 'About Burlington, Vermont' (Burlington, Vt., 1905); Possons, 'Burlington, Vt., as a Manufacturing, Business and Commercial Centre' (Glens Falls, N. Y., 1890); 'Vermont Historical Gazetteer' (Vol. 1, 4 vols., Burlington 1867–82), and *New England Magazine* (Vol. XI, 2d series).

BURLINGTON, Wis., city in Racine County, 35 miles southwest of Milwaukee, on the Chicago, Milwaukee and Saint Paul and the Minneapolis, Saint Paul and Sault Sainte Marie railroads. It is a prosperous dairying centre and has brickyards, tileyards, brassworks, condensed milk factory and manufactories of baskets, horse blankets and veneer. The waterworks are the property of the municipality. Consult Wood, 'Burlington: Its Early Growth, History and Progress' (Burlington 1908). Pop. 3,212.

BURLINGTON LIMESTONE, a limestone of sub-Carboniferous (Mississippian) Age, named for its occurrence near Burlington, Iowa. It is also found in other parts of the Mississippi Valley. This limestone is of light color and fine-crystalline, resembling lithographic stone. It has important industrial value.

BURMA, India, the largest province of British India, on the east side of the Bay of Bengal, at one time formed the greater portion of a native kingdom or empire, which is said to have extended from lat. 9° to 26° N., and from long. 92° to 104° E. Its greatest length was about 1,000 miles and its breadth 600, its area being then about 270,000 English square miles. In 1826 the provinces or divisions of Arracan and Tenasserim were occupied by the British, and in 1852 Pegu and the province of Martaban shared the same fate. This portion was then known as British Burma and continued to be so till in 1886 the rest of the kingdom was annexed by Great Britain, when the two portions came to be designated Upper and Lower Burma, respectively. They now form together one province under a lieutenant-governor and legislative council. Total area, about 231,000 square miles; population, over 12,000,000, mainly Buddhists.

Lower Burma is to a large extent mountainous in character, the only extensive level being in Pegu, where the valleys of the Irrawadi and Sittaung form an alluvial tract of about 10,000 square miles. The rainfall varies from less than 60 inches in some places to 190 or more in others. About half the soil is believed to be cultivatable, but a comparatively small portion is as yet under cultivation, though agriculture is extending year by year. Since the occupation of the country by the British it has rapidly increased in prosperity, and the revenue is generally greater than the expenditure. The imports and exports together exceed $84,500,000, the bulk of the trade being with Great Britain. The capital and principal port is Rangoon. Other towns are Moulmein, Akyab and Bassein. Upper Burma is on the whole similar in character to Lower Burma, but less productive, and has generally a smaller rainfall. It is rich in minerals, including gold, silver, precious stones, marble, iron, lead, tin, antimony, arsenic, sulphur and petroleum. Only a few of these are worked. The chief precious stones are the ruby and the sapphire; amber and jade are also found. All precious stones used to be sent to the royal treasury and strangers were prohibited from approaching the places where they were found. These districts are still the subject of special regulation under the British rule. The whole country is intersected by numerous streams, which, following the direction of the chief mountain chains, flow generally south to the Indian Ocean. The chief of these are the Irrawadi, the Salween and the Chindwin, which joins the Irrawadi, the combined stream being of great volume. The Irrawadi is of great value as a highway of communication and traffic, being navigable beyond Bhamo, near the Chinese frontier. In their upper courses the rivers flow through narrow valleys; in their lower courses they traverse low-lying districts, and in the rainy season often overflow their banks. Among the wild animals of the country are the elephant, rhinoceros, tiger, leopard, deer of various kinds and the wild hog. The rivers abound with fish. Of domestic animals we may mention the ox, buffalo, horse, elephant and cat. In the southern districts, owing to the numerous rivers, the soil is most productive. Here grow rice, sugar cane, tobacco, cotton, indigo and all the tropical fruits. Tea is cultivated in many of the more elevated parts. The forests produce timber of many sorts, including teak. A great part of the trade of the country is carried on by means of the Irrawadi River. From Bhamo goods are conveyed to China. Rice is the great crop (occupying about 80 per cent of the cultivated area), and this grain forms the chief export, others being teak, cotton and silk stuffs, petroleum, saltpetre, paper and lacquer ware. About 12,446 miles of roads are maintained, and the number of railway miles open is now about 1,000. From Rangoon two lines proceed north, one along the left bank of the Irrawadi to Prome and Meaday, the other through the Sittaung Valley to Mandalay, and from that on the other side of the Irrawadi to Bhamo and Mogaung.

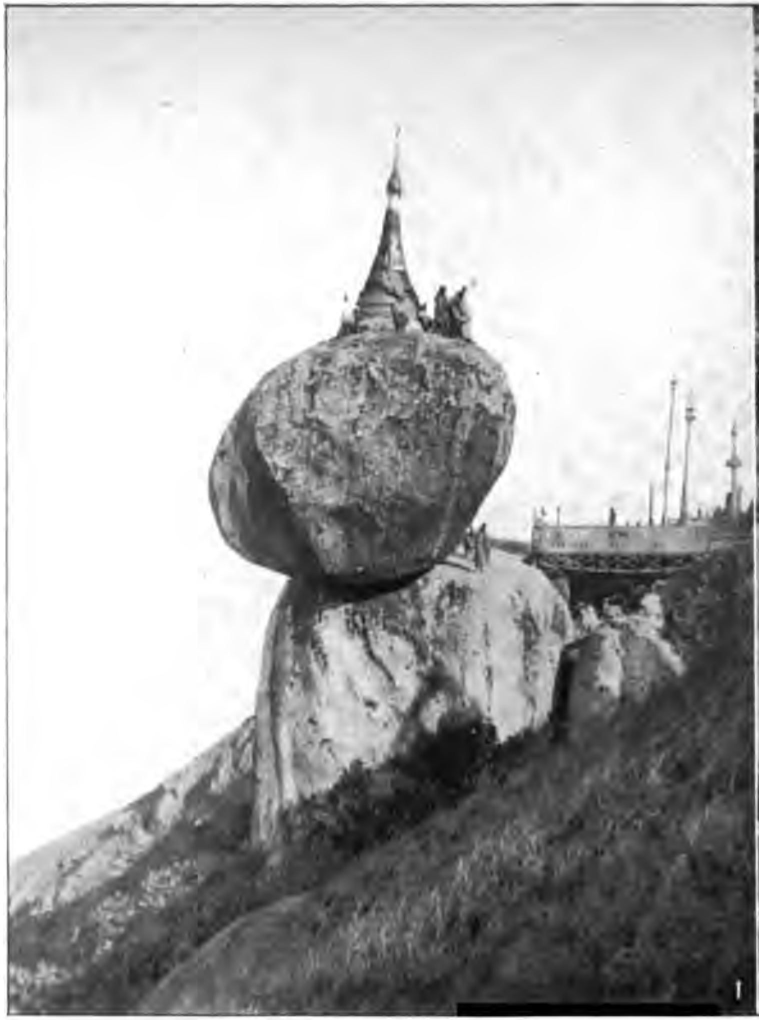
The Burmese have many skilful weavers, smiths, sculptors, workers in gold and silver, joiners, etc. Among industrial establishments are rice-mills, saw-mills, a few works for iron goods, ship-building yards, cutch works, etc. Other industries include boat-building, weaving, pottery, lacquerwork and brasswork. The weaving of cotton and silk goods is carried on by the women everywhere. The pottery of the country is strong and durable, if not especially artistic; and the gold and silver work finds numerous purchasers outside the country. Wood-carving is extensively practised for the adornment of houses, boats, etc. The native vessels plying on the Irrawadi and other rivers are often of 100 to 150 tons burden, while thousands of small craft are engaged in trade or fishing. Large numbers of good cigars are made by women, and are partly used in the country, partly exported. The buildings among the Burmese are very slight, as the government used to require them to be chiefly of wood or bamboo, and prohibited the use of stone or brick except for pagodas, and other important structures.

People.— The Burmese are divided into several tribes, and belong to the common Indo-Chinese stock. Among the tribes other than the Burmese proper are the Karens, Kakhyens, Shans, etc. The Burmese proper are of a brown color, with lank, black hair, and vigorous, well-proportioned frames. No Burmese can have more than one wife; but he may have as many mistresses as he will. The latter live in the same house with the wife, and are her servants. The Burmese women enjoy a good deal of freedom; are not shut up as in some parts of the East, and can even engage in a lawsuit in their own name. The chief amusement of the Burmese is their theatre, where declamation, dancing and music are given by turns. The new year (which begins in April) is celebrated with what is known as the «water feast,» when young men and women throw water on each other and the passers-by. The Burmese usually write on palm leaves with an iron style or on black tablets with a pencil; the rich have libraries, with books, the leaves of some of which are thin pieces of ivory, with gilt edges. Their materia medica is chiefly confined to herbs, spices and mercury; with vaccination they have long been acquainted. The language is monosyllabic, like Chinese, and written with an alphabet (derived from India), the characters of which are more or less circular. Among the common people the principal part of the male dress consists of a double piece of cloth about five yards long, loosely wrapped about the body. Over this a frock is worn, with sleeves open in front, and reaching below the knees. The lower classes of women wear only a single garment, resembling a sheet, wrapped round the body and fastened under the arms. Men of rank wear a long robe of flowered velvet or satin, with open sleeves and collar, a mantle or scarf being thrown over this. On the head is worn a high velvet or silk cap, plain or embroidered, according to rank. The men wear earrings, often of large size. Women of the higher classes generally wear a shift which reaches only to the pit of the stomach, where it is drawn tight and fastened by strings. This is covered by a loose jacket, with tight sleeves. A piece of silk or cloth encircles the waist and descends to the feet. When a woman wishes to be particularly fine she stains her nails and palms a red color, and tinges her teeth and the edges of her eyelids with black. Both sexes wear the hair long; the men tying it in a knot on the crown of the head, the women on the back. Sandals are often worn, but neither boots, shoes nor stockings; every man, woman and child, however, carries an umbrella. The chewing of betel and smoking of tobacco are universal. The Kakhyens or Singfo are a courageous people inhabiting the upper basin of the Irrawadi above Bhamo. They practise a sort of nature worship, and are active as traders, though at present rather lawless. Their villages are ruled by hereditary chiefs. Chinese from Yunnan have settled in considerable numbers as traders and agriculturists in the Kakhyen country; and in Lower Burma they are now a highly important element in the population as traders and otherwise. In the hilly districts of Tenasserim and Pegu we find the Karens, a somewhat secluded people, less intelligent and more ignorant than the Burmese, and not so purely Mongolian in physical character. The Talaings or Mons of the Irrawadi delta resemble the Burmese, but speak a distinct language. The Shans are a numerous people closely allied to the Siamese, and inhabiting eastern and northeastern Burma, together with portions of the neighboring countries.

The native government was an absolute monarchy, the King having unlimited power over life and property. The seat of government, after oscillating between Ava and Amarapura, was latterly fixed in Mandalay, a new town founded in 1857, and situated in a dusty plain a little over two miles from the left bank of the Irrawadi, and about 28 miles northwest from Amarapura. The King was assisted in governing by a council of state known as the *Hlootdaw*, to which belonged at once the functions of a legislature, a cabinet and a supreme court of justice. It was composed of officials of 14 grades, the president being the King himself, some other member of the royal family or the Prime Minister. The King had power to punish at his pleasure anyone, including even the great officers of state. The public revenue was derived from taxes levied in a very irregular and capricious manner, and as the officials received no fixed salary corruption and oppression were extremely prevalent. The criminal laws were barbarously severe. Capital punishment was commonly inflicted by decapitation, but crucifixion and disemboweling were also practised. Torture might be applied to principals or witnesses; and trial by ordeal was not unknown. The standing army was small. Levies were made, in case of war, by way of conscription; and a specified number of houses was required to furnish a soldier or pay a fine. The religion of the country is that of Buddha, which is said to exist here in great purity. The tutelary divinities worshipped in various Buddhist countries are unknown, and the vows of poverty and chastity taken by the monks are said to be less frequently broken here than elsewhere. The Burmese possess a complete system of education so far as male children are concerned. All boys are required to reside in a religious house for three years and there they act as servants to the priests who instruct them in reading, writing and arithmetic, as well as the doctrines of their religion. Upward of 90 per cent of the population dwell in rural areas, and no tendency toward gravitation to the towns is observed. Notwithstanding the fact that the social position of women is so assured in Burma and that there is no suspicion of the existence of female infanticide, women number only 962 in 1,000 against 1,006 and 1,022 in Bengal and Madras. But the explanation probably lies in the preponderance of the male element among the numerous immigrants into the province. Marriage in Burma is a purely secular ceremony, and elementary education is far more widely dispersed than in India, one individual in five being able to read and write.

History.— The Burmese empire is of little note in ancient or general history. Buddhism and civilization are said to have been introduced from India. The last native dynasty was founded by a Burmese called Alompra, a man of obscure birth, who defeated the Peguans, and in 1753 obtained possession of Ava. Having made himself master of Burma, he invaded Siam; but during this invasion he died suddenly in 1760. Alompra ruled well and wisely, and Namdogee, his eldest son and successor, who died in 1764, inheriting his father's spirit,

BURMA



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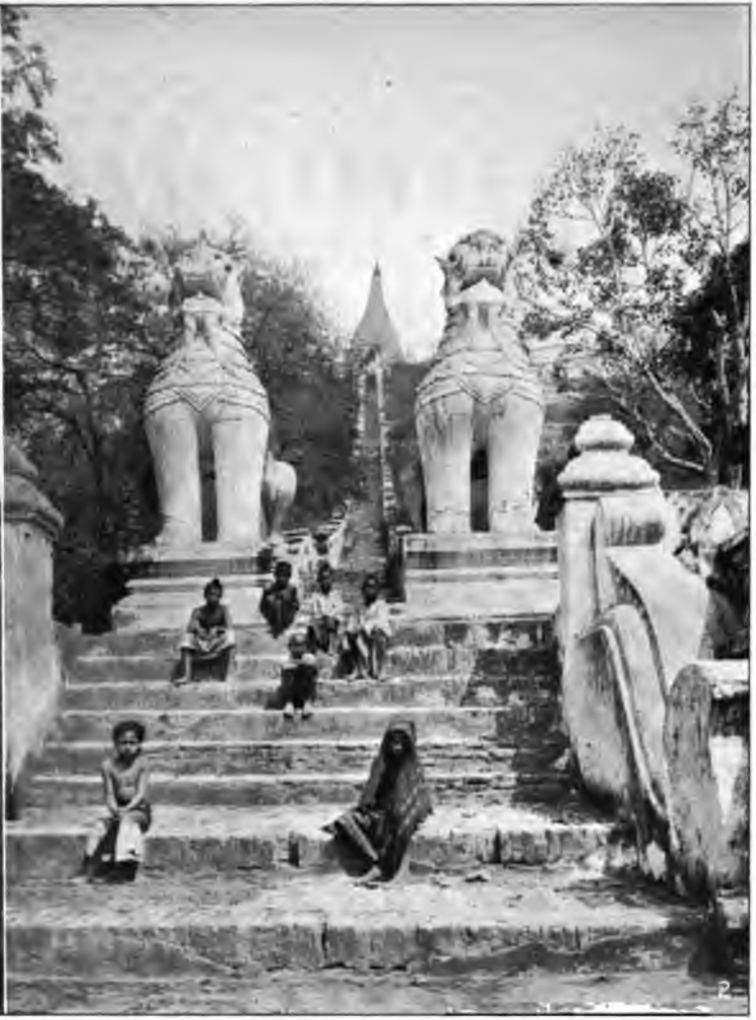
1 Kyailteyo Pagoda miraculously balanced by a hair of Buddha



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2 The 300 Lion steps leading to the Sagaing prayer temple

introduced various reforms and useful measures. Shembaun (Tshen-bo-yen), the Emperor's brother, became regent as guardian for his nephew Momien; but he usurped the throne himself and conquered Siam. In 1771, however, Siam recovered its independence, while the principal part of the Burmese forces were engaged in a war with China. In this war they were victorious, and compelled the Chinese whom they took prisoners to intermarry with Burmese females, and to remain in their territory. In 1776 Shembuan left his empire, much enlarged, to his son, Chenguza. This prince lived in the unrestrained indulgence of every appetite till in 1782 he was dethroned and put to death. In consequence of the revolution, Mentaragyi, the fourth son of Alompra, ascended the throne. He ordered his nephew, Momien, who was a state prisoner, to be drowned, and in 1783 subdued the kingdom of Arracan. He then engaged in a war with Siam, which continued till 1793, when peace was made on certain conditions. About this period, it happened that some robbers fled from the Burmese empire, and took refuge in the territory of the East India Company. The Burmese demanded that they should be delivered up, and on their demands not being immediately complied with, marched with a strong force into the offending country. At the same time they carried on a friendly negotiation with the government in Calcutta, which resulted in the surrender of the criminals, and the conclusion of a treaty of amity and commerce between the two governments, negotiated by Captain Symes. The last victory of the Burmese was in 1822 over the province of Assam. The party driven from Assam, together with the Burmese rebels, fled to the British territories, whence they intended to invade Burma. The British government disarmed the insurgents, but refused to deliver them up or to drive them from the island of Shapuri, which they had occupied. At length the Burmese sovereign demanded of the government at Calcutta the cession of northern Bengal as being a part of Ava, and in January 1824 his forces marched into Cachar, which was under British protection. Lord Amherst, as governor-general of the British East Indies, now declared war against Burma, and Gen. Archibald Campbell prosecuted it so successfully that after the victory at Prome (1–3 Dec. 1825), he obliged the monarch to conclude a peace at Palanagh in 1825. As the treaty was not ratified on the part of the Burmese Emperor by the time specified (18 Jan. 1826), Campbell renewed the war and stormed the fortress of Munnum. On 24 February the peace was ratified, and the war concluded with the cession of Arracan, Mergui, Tavoy, etc. In 1852 a second war broke out at the conclusion of which Rangoon and the whole of Pegu fell into the hands of the British. About 1860 the new city Mandalay supplanted Amarapura as the capital. In 1867 British steamers were permitted by treaty to navigate Burmese rivers, and not long after traffic was carried on up the Irrawadi as far as Bhamo. In 1885 the outrageous proceedings of King Theebaw provoked another war, and a British force proceeded from Rangoon up the Irrawadi River, took Mandalay and sent King Theebaw a prisoner to Rangoon. On 1 Jan. 1886, Theebaw's dominions were annexed to the British empire by proclamation of the viceroy of India (the Earl of Dufferin). After the annexation there was a considerable amount of scattered fighting with dacoits and others, but this has ceased since 1890 and the country is now opened up to commerce, and is rapidly advancing in prosperity. In 1897 Burma was constituted a province, and placed under a lieutenant-governor instead of a chief commissioner.

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Charles Leonard-Stuart,
Editorial Staff of The Americana.

BURMEISTER, boor'mīs-tėr, **Hermann**, German scientific writer: b. Stralsund, 15 Jan. 1807; d. Buenos Aires, Argentina, 2 May 1892. In 1842, he became professor of zoology at Halle. He distinguished himself as a geologist and zoologist in his native country, and settled permanently in Argentina, where he continued his investigations. He traveled in South America, and was for a time director of the Museum of Natural History at Buenos Aires. Among his works are 'Handbuch der Entomologie' (5 vols., Berlin 1831–55); 'Geschichte der Schöffung' (Leipzig 1843); 'Systematische Übersicht der Tiere Braziliens' (3 vols., 1854–56); and many contributions to scientific periodicals.

BURMEISTER, Richard, German-American musical composer: b. Hamburg, Germany, 7 Dec. 1860. He received an academical education in Hamburg; studied with Franz Liszt, and in Rome, Budapest and Weimar; made concert tours in Europe in 1883–85 and in the winter of 1893; was at the head of the piano department of Peabody Institute, Baltimore, Md., 1885–97; and settled in New York in the latter year. He made concert tours all over the United States and was director of the Scharwenka Conservatory, New York, in 1897–99. In 1903 he became head of the piano department of the Royal Conservatory of Dresden. Since 1907 he has been living in Berlin. He has composed 'The Sisters' (a dramatic tone poem), numerous songs, and piano, violin and orchestra pieces; and arranged Liszt's 'Concerto Pathétique,' originally for two pianos, for the piano and orchestra.

BURN, Sir George, Canadian banker: b. Thurso, Scotland, 10 April 1847. He was educated in Scotland and was trained in the Royal Bank of Scotland. He joined the staff of the Royal Canadian Bank in 1866; in 1880 was appointed general manager of the Bank of Ottawa. He was elected president of the Canadian Bankers' Association in 1915; has been prominently identified with philanthropic and patriotic work, and was knighted in 1917.

BURNABY, Frederick Gustavus, English soldier and traveler: b. Bedford, England, 3 March 1842; d. 17 Jan. 1885. He was educated at Bedford and Harrow, and entered the Royal Horse Guards in his 18th year as cornet. In 1861 he became lieutenant, in 1866 captain, major in 1879, lieutenant-colonel in 1880, and finally, in 1881, was appointed colonel, a rank which he held till his death. He was military correspondent for the London *Times* with Don Carlos in Spain, and joined Gordon in the Sudan. In 1875 he made his famous ride to Khiva — a journey that presented great difficulties. During the ride, which he undertook partly because he had learned that the Russian government kept Europeans out of central Asia, he suffered severely from the intense cold prevailing at the time when he crossed the steppes. In 1876 he rode through Asiatic Turkey and Persia. Of both these journeys he published narratives, namely, 'Ride to Khiva' (1876, 11th ed., 1877, new ed., 1884), and 'On Horseback Through Asia Minor' (1877). In 1880 he was the unsuccessful candidate for the Birmingham seat in Parliament. While serving as lieutenant-colonel of the Royal Horse Guards in the Egyptian campaign, he was killed at the battle of Abu-Klea. Consult Mann, 'Life of Burnaby' (London 1882) and Wright, 'The Life of Colonel Fred Burnaby' (London 1908).

BURNAND, Sir Francis Cowley, English author: b. 29 Nov. 1837; d. 21 April 1917. He was educated at Eton and Trinity College, Cambridge, and at first studied with a view to entering the Church of England, but when in 1858 he became a Roman Catholic he devoted himself to legal studies, and was called to the bar in 1862. By that year he had already achieved some success as a writer, and in consequence he seldom practised. After about a year's connection with *Fun* he joined the staff of *Punch* in 1863, and was editor from 1880 to 1906. His book, 'Happy Thoughts,' republished from *Punch* went through several editions, and was followed by 'More Happy Thoughts' (1871); 'Happy Thought Hall' (1872); 'Quito at Home' (1890). Other successful productions of his are the extravaganzas, 'New Light on Darkest Africa,' and 'Ride to Khiva' (making fun out of Stanley and Colonel Burnaby respectively), the parody on Ouida's novel, 'Strathmore,' which he published under the title of 'Strapmore,' and 'The Modern Sandford and Merton.' Numerous plays have come from his pen, mostly of the nature of burlesques and light comedies, such as the plays 'Black-eyed Susan' (a burlesque of Douglas Jerrold's drama), and 'The Colonel.' He issued a history of the Amateur Dramatic Club which he had founded at Cambridge University. He collaborated with Sir A. Sullivan in the light operas 'The Chieftain,' produced in 1894, and 'Contrabandista.' He was knighted in 1902, and published an interesting volume of 'Records and Reminiscences.'

BURNE-JONES, Sir Edward, English painter: b. Birmingham, 28 Aug. 1833; d. London, 17 June 1898. In 1852 he went to Exeter College, Oxford, where he was a fellow student of William Morris, and afterward became acquainted with A. C. Swinburne (who dedicated his 'Poems and Ballads' to him). His first intention was to enter the Church of England, and it was not till he had reached his 22d year that he seriously devoted himself to art studies; but, going to London in 1855, he came under the influence of D. G. Rossetti and the Pre-Raphaelite movement, and soon attained considerable success in various departments of artistic work. In 1859 he set out on a journey through Italy in order to see the productions of the early Italian painters and sculptors, and on his return to England he gave in his stained-glass designs and his pictures splendid promise of his subsequent triumphs. In 1865 he began a series of illustrations to Morris' 'Earthly Paradise,' and he also executed some 70 designs for the 'Story of Cupid and Psyche,' besides pictures dealing with the same subject. He was elected a member of the Old Society of Painters in Water Colors in 1864, but withdrew from it in 1870, and from this year till 1877 scarcely ever exhibited in London. In the Grosvenor Gallery exhibition of the latter year, however, his works formed the chief attraction. He received the Cross of the Legion of Honor in 1880, was elected in 1885 Associate of the Royal Academy, a position which he resigned in 1893 (having only exhibited one picture at the Academy, 'The Depths of the Sea'), and he was created a baronet in 1894. His most important pictures are 'Day, Night'; 'Spring, Summer, Autumn, Winter' (1867–68); 'The Wine of Circe' (1869); 'Chant d'Amour' (1873); 'Beguiling of Merlin' (1877), an illustration of Tennyson's 'Merlin and Vivien'; 'Six Days of Creation' (1877); 'The Golden Stairs' (1880); 'The Wheel of Fortune' (1883); 'Wood Nymph'; 'King Cophetua' (1884); 'Laus Veneris'; 'The Depths of the Sea' (1886); and 'The Briar Rose' series (1890). He holds a specially high place as a designer for stained-glass windows, and in many other departments of decorative art. His leading characteristics as a painter are his fertile imagination and fine poetic feeling, qualities which no painter of the century has possessed in anything like the same degree. The Old-World dreaminess of his work is finely aided by his wonderful power as a colorist. In common with his friends, Morris and Rossetti, he exercised a most potent influence on Victorian art. Consult Bell, 'Edward Burne-Jones' (1902).

BURNELL, Arthur Coke, English Orientalist: b. Gloucestershire 1840; d. 1882. He was educated at Bedford and King's colleges, entered the Indian Civil Service, and became immersed in South Indian palæography. His 'Handbook of South Indian Palæography' was regarded by Max Müller as indispensable to every student of Indian literature.' A 'Classified Index to the Sanskrit MSS.' in the palace at Tajore appeared in 1880. 'The Law of Partition and Succession' showed how well he had grasped the fundamentals of Indian law. He left unpublished 'A Translation of the Ordinances of Manu' (1885); and (jointly with Colonel Yule) 'Hobson-Jobson; being a Glossary of Anglo-Indian Colloquial Words and Phrases' (1886). He was a remarkable linguist, having a knowledge of Sanskrit, Tibetan, Pali, Kawi, Javanese, Koptic and Arabic, and in his later years he became deeply absorbed in the Italian writers of the Renaissance. An ardent booklover himself, he overflowed with helpfulness and generosity to other students. His collection of over 350 Sanskrit MSS. was gifted in 1870 to the India Library, and by the time of his death he had again collected an equal number, which were purchased from his heirs on behalf of the same institution.

BURNES, Sir Alexander, Scottish soldier and traveler: b. Montrose 1805; d. Cabul, 2 Nov. 1841. Having obtained a cadetship, he joined the Bombay native infantry in 1821.

Here his proficiency in Hindustani and Persian procured him two regimental appointments as interpreter, and contributed greatly to his future promotion. In 1830 he was appointed to proceed to Lahore, ostensibly for the purpose of delivering a present of horses from the King of England to Runjeet Singh, but really for the purpose of acquainting himself with the lower Indus, with the view of opening it up to commercial enterprise. On returning from this mission, which he successfully accomplished, he proposed a mission into central Asia, and having obtained the sanction of the government, set out in January 1832, descended the Sutlej to Lahore, and proceeded thereafter to Peshawur, Cabul and Bokhara. He afterward traveled with a caravan across the desert of Merv, visited the Shah of Persia in his capital of Teheran, traveled southward to the Persian Gulf and reached Bombay after a year's abscence. He published an account of this journey in 1834, under the title of 'Travels into Bokhara.' He was afterward sent to England as the bearer of his own despatches, received the special thanks of the court of directors and was presented with the gold medal of the Royal and the silver medal of the French Geographical Society. He returned to India in 1835, and in the following year was sent on a commercial mission to Cabul. While there he discovered that Russia was intriguing to detach the Emir, Dost Mohammed, from the British alliance, and on finding the Emir disposed to be friendly to Great Britain, he urged Lord Auckland to come to terms with him. His advice was, however, rejected, and a force was dispatched in 1839 to reinstate Shah Sujah on the throne. Burnes accompanied the force as second political officer, and received the honor of knighthood. On the breaking out of an insurrection in Cabul, he was murdered with his brother and several other Europeans.

BURNET, Gilbert, British prelate and historian: b. Edinburgh, 18 Sept. 1643; d. London, 15 March 1715. Having graduated at Marischal College, Aberdeen, he zealously devoted himself to the study of law and divinity. In 1661 he qualified as a probationer in the Church, and traveled into Holland in 1664. On his return he was made fellow of the Royal Society in London, and ordained to the living of Saltoun, Haddingtonshire, in 1665. In 1669 he was made a professor of divinity at Glasgow, where he published his 'Modest and Free Conference between a Conformist and a Nonconformist,' and wrote his 'Memoirs of the Dukes of Hamilton' (1676); and was offered a Scottish bishopric, which he refused. His 'Vindication of the Authority, Constitution, and Laws of the Church and State of Scotland,' in which he maintains the cause of episcopacy, was much approved of at court, and several bishoprics were successively offered him and refused. In 1673 he was made chaplain in ordinary to the King, and was in high credit both with Charles and the Duke of York. Removing to London he received the appointment of chaplain to the Rolls Chapel in 1675, and shortly afterward the lectureship at Saint Clement's. The nation being alarmed on account of the progress of Catholicism, Burnet undertook a 'History of the Reformation in England.' He gave a first volume to the public in 1679, when the affair of the popish plot was in agitation. It procured for the author the unprecedented honor of thanks from both houses of Parliament. The second appeared in 1681; the third, which was supplementary, in 1714. The high character of Burnet as a divine caused him to be sent for by the witty and profligate Earl of Rochester, when, exhausted by a course of libertinism, he was sinking into the grave. The result of his conferences with the dying nobleman he gave to the world in his celebrated 'Account of the Life and Death of the Earl of Rochester.' About this time he wrote a letter to the King censuring his public misgovernment and private vices. His connection with the opposition party was now very intimate, and he attended Lord William Russell to the scaffold, when executed for his share in the Rye House plot. He published during this period several works in favor of liberty and Protestantism, and wrote the lives of Bishop Bedell and Sir Matthew Hale (1682); and in 1683 made his translation of More's 'Utopia.' On the accession of James he made a tour in France and Italy, and in 1687 he published an account of his travels in a series of letters to Robert Boyle. When at Utrecht he was invited to The Hague by the Prince and Princess of Orange, and had a great share in the councils relative to Britain. James caused a prosecution for high treason to be commenced against him in Scotland, and demanded his person from the States, who refused to deliver him up. In the revolution he took an active part, accompanying the Prince of Orange to England as chaplain, and was rewarded for his services by the bishopric of Salisbury. On taking his seat in the House of Lords, he displayed his usual moderation in regard to the non-juring clergy and dissenters. As a prelate, Bishop Burnet distinguished himself by fervor, assiduity, tolerance and charity. In 1699 he published his 'Exposition of the Thirty-nine Articles.' The scheme for the augmentation of poor livings out of the first-fruits and tenths due to the Crown, known as Queen Anne's Bounty, originated with Burnet. He left behind him in manuscript his well-known 'History of His Own Times' (1723-34), upon which the best judgment to-day is that nothing could be more admirable than his general candor, his accuracy as to facts, the fullness of his information and the justice of his judgments, both of those whom he vehemently opposed and of those whom he greatly admired. The value of the work, says a recent authority, "as a candid narrative and an invaluable work of reference, has continually risen as investigations into original materials have proceeded."

BURNET, Jacob, American jurist: b. Newark, N. J., 22 Feb. 1770; d. Cincinnati, Ohio, 10 May 1853. He was graduated at Princeton 1791, was admitted to the bar in 1796, removed to Cincinnati, then a village with about 500 inhabitants, and was a member of the territorial government from 1799 till the establishment of a State government in 1803. In 1821 he was appointed judge of the Supreme Court of Ohio, and was elected United States senator in 1828, and was prominent in the legislation to remove the national debt of the Middle West for public lands; and for the completion of the Miami Canal. Burnet was elected a member of the French Academy of Sciences upon the recommendation of Lafayette, and published in 1847 a volume of 'Notes on the Northwestern Territory.' He was prominent in civic enterprises in Cincinnati for over half a century, assisting to establish the Lancastrian Academy; helping to found the Cincinnati College, whose first president he was; besides being president of the Ohio Medical College and the Cincinnati Colonization Society and the Cincinnati branch of the United States Bank.

BURNET, John, Scottish engraver, painter and art-critic: b. Musselburgh, near Edinburgh, 20 March 1874; d. 1868. He learned etching and engraving, and, with Sir William Allan and Sir David Wilkie, was a student in drawing and painting at the Trustees' Academy, Edinburgh. In 1806 he went to London, where he engraved Wilkie's 'Jew's Harps'; 'Blind Fiddler'; 'Rent Day'; 'Rabbit on the Wall'; 'Chelsea Pensioners Reading the Gazette of the Battle of Waterloo' (his largest and most elaborate work); 'Letter of Introduction'; 'Death of Tippoo Sahib'; and 'Village School.' He also engraved plates from several recent painters, from the Rembrandts in the National Gallery and from several of his own paintings. Among his written works, for which he still maintains a reputation, are 'Practical Treatise on Painting' (1827); 'Rembrandt and His Works' (1849); 'Life and Works of J. W. M. Turner,' with Cunningham (1852). He was a sound and careful painter, but possessed little originality. He was made a fellow of the Royal Society, and in 1860, receiving a civil pension, he retired. Consult Pye, 'Patronage of British Art' (in *Art Journal* 1850, 1868).

BURNET, John, Scottish classical scholar: b. Edinburgh, 9 Dec. 1863. He was educated at the Royal High School and University, Edinburgh, and Balliol College, Oxford, and has been professor of Greek in Saint Andrew's University since 1892. His works include 'Early Greek Philosophy' (1892); 'Greek Rudiments' (1897); 'Platonis Opera' (5 vols., 1899–1907); 'Plato's Phædo' (1911); 'Greek Philosophy, Part I' (1914).

BURNET, Thomas, English divine and philosopher: b. Croft, Yorkshire, about 1635; d. London, 27 Sept. 1715. He was educated under Dr. Ralph Cudworth at Cambridge, and afterward traveled as tutor to several young noblemen. In 1681 he made himself known by his 'Telluris Theoria Sacra,' which he subsequently translated into English. In 1685 he became master of the Charterhouse and after the revolution of 1688 was appointed chaplain in ordinary and clerk of the closet to King William. In 1692 he published 'Archæologiæ Philosophicæ, sive Doctrina Antiqua de Rerum Originibus,' but the freedom of opinion displayed in this work led to the removal of the author from the clerkship of the royal closet. Two posthumous works of this author appeared in 1727 — the treatise 'De Fide et Officiis Christianorum'; 'De Statu Mortuorum et Resurgentium.' All the works of Burnet exhibit him as an ingenious speculator, rather than as a patient and sober inquirer concerning the moral and natural phenomena of which he treats. His great work, the 'Theory of the Earth,' is one of the many systems of cosmogony in which Christian philosophers have attempted to reconcile the Mosaic account of the creation, paradise and the deluge, with the traditions of the ancient and the principles of modern science. His speculations are recommended by sublimity of description and eloquence of style. In his 'Archæologiæ Philosophicæ' he has combatted the literal interpretation of the history of the fall of man; and to expose its improbability he has introduced an imaginary dialogue between Eve and the serpent, which, as coming from the pen of a divine, is singular enough. It is only to be found in the first edition of the work.

BURNET, William, American colonial governor: b. The Hague, Holland, 1688; d. Boston, 7 Sept. 1729. He was a son of Gilbert Burnet (q.v.) and was appointed governor of New York and New Jersey in 1720. Two years later he founded at Oswego the earliest English trading post on the Great Lakes as the first step in his able Indian policy in New York which accomplished very much for the interests of the mother country and the colonies. In 1728 he was transferred to the governorship of Massachusetts and New Hampshire and was speedily involved in disputes with the assembly of the former colony over the question of salary. He was fond of astronomical studies and published observations in the 'Transactions' of the Royal Society.

BURNET, the popular name of two genera of plants of the family *Rosaceæ*. (1) Garden Burnet (*Sanguisorba*), a perennial plant which grows to the height of about two feet; leaves smooth, alternate, imparipinnate, composed of serrate leaflets; flowers arranged in rounded heads of a purplish color, with the female flowers above and the male flowers below. It is a native of Europe but has become naturalized in sunny places among rocks and in open fields, from New York to Maryland. It is cultivated in kitchen gardens for its aromatic leaves, which are used to season salads. (2) Canadian Burnet (*S. canadensis*) is also a perennial plant; calyx of four divisions; stamens four. Its stem is straight, from three to six feet in height; leaflets ovate, smooth. This plant grows chiefly in bogs and wet places from Labrador to Georgia, and west to Michigan.

BURNET MOTH, the name for the genus of hawkmoths, called *Anthrocera*, or, by some, *Zygæna*. *Anthrocera filipendulæ* is the six-spot burnet moth. The six spots, which are on the superior wings, are red, while the rest of the wings are green. Its caterpillar, which feeds on the plantain, trefoil, dandelion, etc., is yellow, spotted with black. *A. loti* is the five-spot burnet moth. It is less common. The caterpillar feeds on honeysuckle, bird's foot, trefoil, etc.

BURNETT, Frances Eliza Hodgson, Anglo-American novelist: b. Manchester, England, 24 Nov. 1849. In 1856 went to Tennessee with her widowed mother, and lived there until her marriage in 1873 to Dr. S. M. Burnett. She has since lived in Washington and Europe. Between the ages of 16 and 20 Mrs. Burnett wrote numerous stories for magazine publication — including 'Vagabondia'; 'Theo'; 'The Fortunes of Philippa Fairfax,' etc. This girlish work was collected later by Charles Scribner's Sons in an edition known as 'Mrs. Burnett's Earlier Stories.' Her first serious literary success was 'That Lass o' Lowrie's' (1877), a novel founded on colliery life in Lancashire. This appeared serially in *Scribner's Magazine* and in book form in 1877. This was followed by 'Haworths' (1879); 'Louisiana' (1880); 'A Fair Barbarian' (1881); 'Through One Administration' (1883); 'A Lady of Quality' (1896); 'His Grace of Osmonde'; 'The De Willoughby Claim' (1899); 'Emily Fox-Seton'; 'The One I Knew the Best of All'; 'The Shuttle'; 'T. Tembarom' (1913), etc. Her books for children are 'Little Lord Fauntleroy' (1886); 'A Little Princess' (1905); 'Two Little Pilgrims' Progress'; 'The Secret Garden'; 'The Lost Prince,' etc. Her dramatic work comprises plays founded upon 'Little Lord Fauntleroy'; 'A Little Princess'; 'Esmeralda' (1881); 'Phyllis'; 'A Lady of Quality'; 'The Dawn of a To-morrow,' etc.

BURNETT, James (LORD MONBODDO), Scottish judge: b. at the family seat of Monboddo, in Kincardineshire, 1714; d. Edinburgh, 26 May 1799. After studying at Aberdeen and Edinburgh he went to the University of Groningen, whence he returned in 1737, and commenced practice as an advocate at the Scottish bar. In 1767 he was raised to the bench on the decease of his relative, Lord Milton. He distinguished himself by his writings as a metaphysician, having published a work on the 'Origin and Progress of Language' (1773–92), and 'Ancient Metaphysics' (6 vols., 1779–99). Lord Monboddo was an enthusiastic admirer of ancient literature, and especially of the works of Plato and other Grecian philosophers. His works contain many interesting observations, but also exhibit some strange and paradoxical opinions. Thus he seriously advocates the existence of satyrs and mermaids, and has advanced some pre-Darwinian speculations on the affinity between the human race and the monkey tribe, which exposed him to a good deal of ridicule on the first publication of his theories. Both his official and his private character were of high standing, and he was, notwithstanding some eccentricities, a man of learning and ability.

BURNETT, Peter Hardeman, first State governor of California and author: b. Nashville, Tenn., 1807; d. San Francisco 1895. After residence in Missouri and Oregon, where he practised as a lawyer and assisted in the organization of territorial government, serving two terms in the legislature, he went to California in 1848 with one of the first band of gold diggers, and became prominent in organizing State government without waiting for Congressional sanction. He was elected governor on the adoption of the constitution, but resigned in 1851. In 1857–58 he was judge of the Supreme Court and from 1863 to 1880 president of the Pacific Bank of San Francisco. His published works, marked by lucid exposition and clear logical thinking, include 'The Path which led a Protestant lawyer to the Catholic Church' (1860); 'The American Theory of Government considered with reference to the Present Crisis' (1861); 'Recollections of an old Pioneer' (1878); 'Reasons why we should believe in God, Love God, and Obey God' (1884).

BURNETT PRIZES, The. Two prizes in theology founded by John Burnett, of Dens, Aberdeen, Scotland, for the two best treatises on "The evidence that there is a Being all-powerful, wise and good, by whom everything exists; and particularly to obviate difficulties regarding the wisdom and goodness of the Deity; and this independent of written revelation, and of the revelation of the Lord Jesus; and from the whole to point out the inferences most necessary and useful to mankind." Burnett, who was born in 1729 and died in 1784, was a merchant of Aberdeen, and was known for his benefactions to the poor. On his death he bequeathed his fortune to found the prizes above referred to, and to establish funds for the relief of the poor and of pauper lunatics. He ordered the prize fund to be accumulated for 40 years at a time, and the prizes (not less than $6,000 and $2,000) to be awarded as above. In 1883 the fund was applied to found a lectureship on natural theology in the University of Aberdeen. Awards of the prizes were, first prize to William Laurence Brown in 1815; second prize to John Bird Sumner in 1848; first prize to Robert A. Thomson in 1855; second prize to John Tulloch in 1860.

BURNEY, Charles, English composer and writer on music: b. Shrewsbury, 12 April 1726; d. Chelsea, London, 12 April 1814. He studied music under the organist of Chester Cathedral there, and at Shrewsbury, under the direction of his half-brother, an organist, and afterward in London between 1744 and 1747, under Dr. Arne. In 1751 he obtained the place of organist at Saint Margaret's Church, Lynn Regis, in Norfolk. Here he commenced his 'General History of Music.' In 1760 he returned to London, where his compositions and the musical skill of his eldest daughter, then eight years of age, excited admiration. In 1769 he took the degree of doctor of music at Oxford. In 1770 he visited France and Italy, and two years afterward the Netherlands and Germany, for the sake of his great work. He published accounts of both tours. After his second return he became a fellow of the Royal Society. In 1776 appeared the first volume of his 'General History of Music from the Earliest Ages to the Present Period' (4to), the second in 1782, and the third and fourth in 1789. He was the author of several other valuable works, among which are the 'Memoir of Handel,' and a 'Life of Metastasio.' He died in the office of organist at Chelsea Hospital, and in receipt of a pension of $1,500. He wrote most of the musical articles in Rees' Cyclopædia. His 2d daughter, Frances or Fanny (Madame D'Arblay, q.v), well known as an authoress, published a memoir of her father.

BURNEY, Charles, English classical scholar and critic, son of Charles Burney (q.v.): b. Lynn, Norfolk, 4 Dec. 1757; d. 28 Dec. 1817. He received his education at the Charter-house School, at Caius College, Cambridge, and King's College, Aberdeen, where he took the degree of M.A. He carried on a private school, distinguished himself as a writer in the *Monthly Review* and the *London Magazine*, to which he contributed many articles on classical literature; subsequently entered into holy orders, and obtained some preferment in the Church. His valuable collection of books, many of them enriched with manuscript notes, was purchased by Parliament for the British Museum.

BURNEY, Frances. See D'ARBLAY, MADAME; EVELINA.

BURNHAM, Sherburne Wesley, American astronomer: b. Thetford, Vt., 12 Dec. 1838. He started in life as a stenographer, and became a clerk in the United States Circuit Court, northern district of Illinois. He took up astronomy as an amateur, and, in 1876, became connected with the Chicago Observatory, and later with the Lick Observatory, receiving also an appointment as professor of practical astronomy at the Yerkes Observatory of the University of Chicago. He has made notable discoveries of double stars, having catalogued 1,274 new ones. In 1874 he was made a fellow of the Royal Astronomical Society of England, receiving its gold medal in 1894 for his discovery and measurement of double stars. In 1900 the Yerkes Observatory issued a catalogue of the stars he discovered. In 1904 he was awarded the Lalande prize of the Paris Academy of Sciences. He published ‘General Catalogue of Double Stars within 121° of the North Pole’ (1906) and ‘Measures of Proper Motion Stars’ (1913).

BURNHAM BEECHES, England, remains of an ancient forest in Buckinghamshire. It is situated some 25 miles northwest of London, and is famous for its enormous beech trees. Since 1883, the Burnham Beeches tract of 374 acres has been open to the public as a park by the Corporation of London.

BURNING-BUSH, or WAAHOO, a tall shrub (*Euonymus atropurpureus*) of the natural order *Celastraceæ* with oval-oblong leaves and purple flowers occurring in fours. It is common throughout the Middle West from New York to Wisconsin and Nebraska, and southward. It is sometimes cultivated for the ornamental effect of its long drooping peduncles of crimson fruit.

BURNING BUSH, The, the place from out of which Yahwe spoke to Moses on Sinai, when he gave him the tables of the law (Exod. iii, 2–4). The story as there told would appear to have resulted from a fusion of two widely current beliefs — that fire indicated the Divine Presence and that certain trees were the permanent abode of deities. In Deut. xxxiii, 11, another form of the story is hinted at according to which the bush was Yahwe's permanent dwelling. The fiery appearance in Exodus is clearly regarded as temporary. Robertson Smith cites some parallels from non-biblical sources, and argues that «the original seat of a conception like the burning bush, which must have its physical basis in electrical phenomena, must probably be sought in the clear dry air of the desert or of lofty mountains.» Consult Baudissin, ‘Studien zur semit Religons-geschichte.’

BURNISHER, a blunt, smooth tool, used for smoothing and polishing a rough surface by pressure, and not by removing any part of the body. Other processes of polishing detach the little asperities. Agates, tempered steel and dogs' teeth are used for burnishing. It is one of the most expeditious methods of polishing, and one which gives the highest lustre. The burnishers used by engravers are formed to burnish with one end and to erase blemishes with the other.

BURNJIRD, Persia, town of the province of Irak-Ajemi, in the Tahji River Valley, about 190 miles north by west of Ispahan. It has manufactories of cottons, felt hats, caps, etc., and a trade in skins, most of which are exported to Russia. Roads connect the town with Ispahan and Hamadan. It boasts a castle and numerous mosques. Pop. 25,000.

BURNLEY, England, a parliamentary and county borough in Lancashire, about 29 miles north of Manchester by rail, situated on the small river Brun, near its confluence with the Calder. The town presents a modern appearance, and is, generally speaking, well built, mostly of stone. The town-hall is a large, handsome building, erected in 1887; there is also a commodious exchange, and a convenient market hall. Among the churches the chief place is due to Saint Peter's, an ancient building restored in 1867. A splendidly equipped technical school was opened in 1909. The public utilities are nearly all publicly owned. The manufactures and commerce of Burnley have rapidly increased in recent years. The staple manufacture is cotton goods, and there are large cotton-mills, worsted-mills and several extensive foundries and machine-shops, with collieries, quarries and other works in the vicinity. Burnley is situated on the Leeds and Liverpool Canal, has a good water supply and has five railway stations. It seems to have been a Roman station, and various Roman remains have been dug up in and around it. Burnley returns one member to Parliament. Pop. 106,765.

BURNOOSE, a large kind of mantle in use among the Bedouin Arabs and the Berbers of northern Africa, commonly made of white or undyed wool, but sometimes also of red, blue, green or some other color, and having a hood which may be drawn over the head in case of rain. In Spain also a similar garment is worn which bears the similar name of albornoz, and the name has also been applied to different kinds of upper garments worn by women of other European countries.

BURNOUF, bůr-noof, **Emile Louis,** French Orientalist, cousin of Eugène Burnouf (q.v.): b. Valognes, Manche, France, 25 Aug. 1821; d. 1907. After a normal school training, he became professor of ancient literature in the faculty of Nancy, and in 1867 director of the French School in Athens. Among his works are ‘Essay on the Veda’ (1863); ‘Sanskrit-French Dictionary’ (1863–65), the first of its kind in France; ‘History of Greek Literature’ (2 vols., 1868); ‘Science of Religions’; ‘The Athenian Legend’; Essays on Antiquity’ (Paris 1879); ‘Method of Studying Sanskrit (1859, 3d ed., Paris 1885); ‘The Mythology of the Japanese,’ according to the ‘Koku-si-Ryakel,’ the first translation of the work into a European tongue (1875); ‘The City and the Acropolis of Athens’ (Paris 1877); and ‘Contemporary Catholicism’ (1879). He also edited the letters of his cousin, Eugène Burnouf.

BURNOUF, Eugène, French Orientalist: b. Paris, 12 Aug. 1801; d. there, 28 May 1852. He commenced his studies at the College of Louis-le-Grand, became a pupil in the École des Chartes in 1822, passed as a lawyer in 1824 and soon after devoted himself to the study of Oriental languages. In 1826 he attracted the attention of men of learning throughout Europe by publishing, in conjunction with his friend, Lassen, an 'Essay on the Pali,' or the sacred language of the Buddhists in Ceylon and the Eastern Peninsula, and in 1827 by furnishing an explanatory text to the series of lithographic plates prepared by Geringer and Chabrelle to illustrate the religion, manners, customs, etc., of the Hindu nations inhabiting the French possessions in India. This work was not completed till 1835. In 1832 he was admitted into the Academy of Inscriptions, and in the same year was appointed to the professorship of Sanskrit in the Collège de France, an office which he held till his death. His fame is chiefly due to his having, so to speak, restored to life an entire language, the Zend or old Persian language in which the Zoroastrian writings were composed. Anquetil-Duperron had obtained the text of the extant works of this sacred language of the Persians. It is the glory of Burnouf to have interpreted those works with the aid of the Sanskrit. To this part of his labors belongs his 'Extrait d'un commentaire et d'une traduction nouvelle du Vendidad-Sadé' (1830); 'Observations sur la grammaire de M. Bopp' (1833); 'Commentaire sur le Yaçna' (1833–35). Burnouf also distinguished himself by his labors on Buddhism. On this subject he published the text accompanied by a translation of the 'Bhâgavata Purâna' (1840–47); 'Introduction à l'histoire du Bouddhisme Indien' (1st vol., 1844), etc. A fortnight before his death the Academy of Inscriptions elected him secretary for life. Consult Lenormant, 'Eugène Burnouf' (Paris 1852); Barthélemy-St.-Hilaire, 'Notice sur les travaux de M. E. B.' (in the 2d ed. of the 'Introduction à l'histoire du Bouddhisme' (1876); 'Choix de Lettres d'Eugène Burnouf' (1891).

BURNOUF, Jean Louis, French classical scholar: b. Urville, Manche, 1775; d. Paris, 1844. He was appointed assistant professor at the Collège Charlemagne in 1807 and professor of Latin there in 1816. In 1840 he became university librarian. He exercised a profound influence on classical learning in France. He published a translation of 'Tacitus' (6 vols., 1827–33, 1881) and a 'Méthode pour étudier la langue grecque' (1814, 1893).

BURNS, Anthony, American fugitive slave: b. Virginia, about 1830; d. Saint Catherine's, Ontario, 27 July 1862. Escaping from slavery he worked in Boston during the winter of 1853–54; but on 24 May 1854 — the day after the repeal of the Missouri Compromise and the passing of the Kansas-Nebraska Bill had inflamed the North against the slave power — was arrested on warrant of Charles F. Suttle through his agent Brent. The next day he was taken before United States Commissioner Edward G. Loring for examination; but Wendell Phillips and Theodore Parker secured an adjournment for two days. Burns, meanwhile, was confined in the courthouse under a strong guard, and on the evening of the 26th a great mass meeting in protest was held at Faneuil Hall. T. W. Higginson and others had planned to stampede the meeting into storming the courthouse and rescuing Burns, and at the appointed time battered in a door and attempted the rescue themselves, relying upon assistance in their undertaking. The size of the meeting, however, prevented the signals from working well and the leaders from emerging, and after a scuffle in which a deputy was fatally stabbed and several assailants wounded, the latter retired. The next day Loring, an ardent upholder of the Fugitive Slave Law, delivered Burns to his claimant on evidence entirely illegal and worthless even under that law. Escorted by a strong military guard, Burns was taken to a government cutter, through streets draped in mourning and crowds ready to stone the soldiers. A riot at the wharf was only prevented by the action of Rev. Daniel Foster upon his saying "Let us pray!" The crowd uncovered and stood quiet while Burns was taken on board. Indictments were drawn against his would-be rescuers, but quashed for want of evidence. Burns afterward gained his liberty, studied theology at Oberlin College and was eventually settled over a Baptist colored church in Saint Catherine's, Ontario, where he died. Consult Stevens, 'Anthony Burns: a History' (1856); Adams, 'Richard Henry Dana: a Biography' (1891); Higginson, 'Cheerful Yesterdays' (1898).

BURNS, John, English labor organizer and statesman: b. London, October 1858. He was of humble birth and became a factory employee at the age of 10. He was an omnivorous reader and imbibed his socialistic views from a French fellow laborer. By working a year as engineer on the Niger River, he earned enough for a six months' tour of Europe. He constantly addressed audiences of workingmen, and was a persistent labor agitator. He was one of the leaders in the West End riot in London, February 1886, and was imprisoned the same year for maintaining the right of public meeting in Trafalgar square. He, in conjunction with Ben Tillett, organized the successful dock strike in London in 1889. He has been thrice elected to the London county council and has sat in the House of Commons as Labor member for Battersea since 1892. From 1905–14 he was president of the Local Government Board, and in the latter year he became president of the Board of Trade. On the outbreak of the Great European War in August 1914, on account of the war policy of the Asquith cabinet, he resigned his place in the government.

BURNS, Robert, Scottish poet: b. near Ayr, Scotland, 25 Jan. 1759; d. Dumfries, 21 July 1796. His father, William Burnes or Burness, a native of Kincardineshire, had been a gardener, but at the time of the poet's birth was a nurseryman on a small piece of land on the banks of the Doon in Ayrshire. He was a man of strong intelligence and deep piety, but unsuccessful in his struggle with poverty. His mother was Agnes Brown, a woman of ability, and, though of meagre book education, well versed in folk-song and legend. Robert, the eldest of seven children, went to school for three years, 1765–68, under John Murdoch in the neighboring village of Alloway. Later he was in attendance for a few months each at Dalrymple parish school in 1772, at Ayr Academy in 1773 and at Kirkoswald about 1776; but the more important part of his education he received from his father and his own reading. In 1766 William Burness had borrowed money to rent the farm of Mount Oliphant; and the future poet by the time he was 16 was doing a man's work, overstraining his immature physique in performing his share in the vain effort of the family to keep its head above water. The scene of the struggle was moved in 1777 to Lochlea, about 10 miles distant, where in 1784 his father died. During the Lochlea period, Burns, ambitious to improve his position, went to the neighboring town of Irvine to learn flax-dressing. Nothing came of this move; but while resident there he formed that acquaintance with a dissipated sailor to which he himself ascribed the beginning of his licentious adventures. On his father's death, Robert and his brother Gilbert rented the farm of Mossgiel, but this experiment was no more successful than those previously made. While here he contracted an intimacy with Jean Armour, which brought upon him the censure of the Kirk-session. Finally the poet, disheartened by successive bad harvests and irritated by the attempts of his father-in-law to cancel his irregular marriage with Jean and to hand him over to the law, determined to emigrate. For 10 years he had been composing verses, some of which had brought him considerable local fame, and these he collected and published in order to raise money for the voyage; but the unexpected success of this volume (Kilmarnock 1786) roused his literary ambition, gave him fresh courage and led him to change his plans. Instead of sailing for the West Indies, he went to Edinburgh in November 1786, and during that winter was the literary lion of the season. Here he met such celebrities as Dugald Stewart, the philosopher; Blair, the rhetorician; Henry Mackenzie, the author of 'The Man of Feeling'; Lord Glencairn; the Duchess of Gordon, and Creech, the publisher. The last named undertook an enlarged edition of his poems (Edinburgh 1787); and while waiting for the profits of this volume, Burns made several tours through the country, traces of which are to be found in a number of occasional poems. Creech finally paid him enough to enable him to give substantial help to his brother in Mossgiel, and to rent and stock the farm in Ellisland in Dumfriesshire. Hither in 1788 he brought Jean Armour, to whom he was now regularly married, his success and fame having reconciled her parents to the match; and for three years he tried farming. But failure still dogged him, and in 1791 he moved to Dumfries, where he lived on a position in the excise service which he had obtained while still at Ellisland through the influence of some of the powerful acquaintances he had made in Edinburgh. He had, however, lost heart; and after a few years of drudgery, varied with the drinking bouts to which he was constantly tempted both by habit and by the invitation of foolish admirers, he died at Dumfries in his 38th year.

Biographies of Burns have frequently been crowded with attempts to disentangle or to explain away the facts of his numerous amours. There is much controversy over the identity of the semi-mythical Mary Campbell, the «Highland Mary» of the songs; much curiosity over the precise degree of Platonism in his feeling for Mrs. McLehose, the «Clarinda» of his letters, and the inspirer of a number of lyrics; much difference of opinion as to whether and how long he was in love with his wife. Into these details we do not enter. It is clear enough that Burns was a man of exceptionally powerful passions, that the extreme and depressing hardships of his youth, and, indeed, of the greater part of his life, along with his natural tendencies to conviviality, drove him to excesses of self-indulgence; and that while he strove often and painfully after better things, his striving was many times without avail. «The sport,» he calls himself, «the miserable victim of rebellious pride, hypochondriac imagination, agonizing sensibility and bedlam passions.» These phrases are true enough, though they do not imply the further explanation of his pitiful career that is found in the habits of his class and time, and the untoward nature of his environment.

Something of his education has already been indicated. His schooling left him with a good grammatical knowledge of English and a reading knowledge of French. His father's care and his own eagerness gave him no slight knowledge of literature; and among other authors we know that he read, of older literature, the Bible, Shakespeare, Spenser, Johnson, Bunyan, Dryden, Locke, Molière, Wycherley; of his own century, Addison, Steele and Pope; Ramsay, Fergusson, Thomson and Beattie; Fielding, Smollett, Sterne and Mackenzie; Shenstone, Gray, and Goldsmith; Hume, Robertson and Adam Smith, and a number of philosophical and theological works. This list is by no means complete, but it is sufficient to correct the impression that Burns's was an «untutored Muse.»

The literary influences apparent in the work of Burns are of two main classes: English and Scottish. So far as he fell under the former of these he was an inferior poet of the school of Pope, an ardent admirer and imitator of such a minor master as Shenstone. In this field his critical judgment was never more than commonplace, and his imitations never first-rate. Almost all of his greatest work was done in his native dialect; and here he is the heir, as well as the last great representative, of an ancient national tradition. Previous to the 17th century there existed a Scottish literature of considerable variety and distinction, produced in part under the patronage of the court. But the Reformation and the union of the crowns of England and Scotland resulted in the disuse of the vernacular for dignified and courtly writing, and it rapidly lost social prestige, until as a literary medium it survived only in the songs of the peasantry and in an occasional piece of satire. The 18th century, however, saw a revival of interest in purely Scottish letters, and the publication of such compilations as Watson's 'Choice Collection of Comic and Serious Scots Poems' (1706–09–11), and Allan Ramsay's 'Evergreen' (1724) and 'Tea-Table Miscellany' (1724–27) was the result of an impulse that showed itself also in renewed attempts to compose in dialect. Among the most important leaders in this movement were William Hamilton of Gilbertfield (who modernized the 15th century poem on Wallace), Allan Ramsay and Robert Fergusson; and each of these had a share in inspiring Burns to work in that field

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in which he achieved his greatest triumphs. Their influence was both general and particular. They showed him by their own success what could be done in the native idiom; and they gave him models of which he was not slow to avail himself. Many of Burns's best known poems are all but imitations of productions, usually inferior, by Ramsay and Fergusson, and to them and their poetical ancestors he was indebted not only for suggestions as to theme and method of treatment, but also for his most characteristic verse-forms. This readiness on the part of Burns to accept from his predecessors all that they had to give, and to seek to maintain loyally a national tradition rather than to strive after mere novelty, has much to do with his success in carrying that tradition to its highest pitch, and in becoming, in a sense almost unique, the poet of his people.

The first kind of poetry which Burns thoroughly mastered was satire; and the most important of his successful efforts in this form, 'The Twa Herds, or the Holy Tulzie,' 'Holy Willie's Prayer,' The 'Address to the Unco Guid,' 'The Holy Fair,' and the 'Address to the Deil,' were all written within less than a year (1785–86). Whatever Burns's feelings may have been about what he suffered in his own person from the discipline of the Kirk, it is clear that the impulse that gave these poems their fire and their influence was something much larger than mere personal grudge. Against the narrow dogma and tyrannical conduct of the so-called «Auld Licht» party in the Scottish Church, there had sprung up the «New Lichts,» demanding some relaxation of Calvinistic bonds and preaching charity and tolerance. Though not a member of this or any ecclesiastical faction, Burns sympathized strongly with their protest; and the shafts of his satire were directed against both the doctrines of the orthodox party and their local leaders. For some time after the Reformation the Scottish people seem to have submitted willingly to the rigorous domination of the Presbyterian ministers; but, after the struggle against Rome and the persecutions of the Covenanting times had alike become matters of history, there began to appear a more critical attitude toward their spiritual leaders. The revolt against authority that spread throughout Europe in the latter part of the 18th century manifested itself in Scotland in a growing disposition to demand greater individual liberty in matters of conduct and belief. It was this disposition that Burns voiced in his satires, the local conditions determining the precise direction of his attack. The substantial justice of his cause, the sharpness of his wit, the vigor of his invective, and the imaginative fervor of his verse, all combined to bring the matter home to his countrymen; and he is here to be reckoned a great liberating force.

Several of the satires were published in the Kilmarnock volume, and along with them a variety of other kinds of poetry. In the words of his preface, «he sings the sentiments and manners he felt and saw in himself and his rustic compeers around him.» Some of these are descriptive of sides of humble Scottish life with which he himself was in the closest contact. 'The Twa Dogs' gives a democratic peasant's views of the lives of lairds and farmers; and the sketch of the factor in this poem has been taken as a reminiscence of what his father had to endure from the arrogance of such an agent. 'The Cotter's Saturday Night' describes with affectionate reverence the order of his father's house; 'Puir Mailie,' 'The Auld Mare Maggie,' 'To a Mouse,' and others, reveal the kindliness of the poet's heart in his relation to animals; 'Hallowe'en' gives a vivid picture of rustic mirth and manners, and preserves a mass of folk-lore. Of the additional poems that appeared in the Edinburgh editions the most notable was 'Tam o' Shanter,' Burns's best sustained piece of narrative, a poem that indicates that, had he worked his vein farther, he might have ranked with Chaucer as a teller of tales in verse.

A large quantity of Burns's poetry remained in manuscript at the time of his death. Of this, much the most remarkable is 'The Jolly Beggars,' in the opinion of many his most brilliant production. This cantata carries to its highest point the far-descended literature of the rogue and the beggar, and its superb spirit and abandon show how heartily the poet could sympathize with the very dregs of society. It is to be noted that, alone among pieces that reach his highest level, it is chiefly in English. Burns wrote besides a large number of epistles, epigrams, epitaphs and other personal and occasional verse, the quality and interest of which vary much, but throughout which one constantly finds phrases and stanzas of superb quality. He came to write verse with great ease; but the result of the training he gave himself in artistic discrimination was to check mere fluency, and to lead him to discard much that was of inferior value in his improvisations. Thus the proportion of his work possessed of real poetic distinction is very high.

But the national importance of Burns, though increased by his influence upon the liberalizing movements of his time, and by his vital descriptions and characterizations of the peasant life of the Scotland of his time, is based chiefly on his songs. The period of Presbyterian despotism already referred to had forced the lyric muse of Scotland into low company, and as a result Burns found Scottish song still pure and fine in melody, but hopelesly degraded in point of both poetry and decency. From youth he had been interested in collecting the sordid fragments he heard sung in cottage and tavern, or found printed in broadsides and chapbooks; and the resuscitation of this all-but-lost national heritage came to be regarded by him in the light of a vocation. Two points are especially to be noted about his song-making: first, that almost all sprang from real emotional experiences; second, that almost all were composed to a previously existing melody. He had begun the composing of love-songs while still almost a boy, and he continued it to the end. During his visit to Edinburgh in 1786–87, he formed a connection with the editor of Johnson's *Musical Museum*, and for this publication he undertook to supply material. Few of the traditional songs were such as could appear in a reputable volume, and Burns's task was to make them over into presentable form. Sometimes he retained a stanza or two, sometimes only a line or refrain, sometimes merely the name of the melody: the rest was his own. His method was to familiarize himself with the traditional air, to catch a suggestion from some stanza or phrase of the old song, to fix upon an idea or situation for the new poem; then, humming or whistling the melody about the fields or the farmyard, as imagination and emotion warmed within him, he worked out the new verses, coming into the house to write them down when the inspiration began to flag. Careful consideration of this process, for the reality of which we have his own authority as well as the evidence of the raw material and the finished product, will explain much of the precise quality and function of Burns as a song-writer. In George Thomson's collection of 'Scottish Airs' he had a share similar to that in Johnson's undertaking, his work for these two publications constituting the greater part of his poetical activity during the last eight or nine years of his life. It was characteristic that, in spite of his financial stringency during these years, he refused to accept any recompense, preferring to regard this as a patriotic service. And a patriotic service it was of no small magnitude. By birth and temperament he was singularly fitted for just such a task, and his fitness is proved not only by the impossibility of separating, by a mere examination of the finished songs, the new from the old, but by the unique extent to which his productions were accepted by his countrymen, and have passed into the life and feeling of his race. See TAM O' SHANTER; COTTER'S SATURDAY NIGHT; JOLLY BEGGARS, THE.

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BURNS, William Chalmers, Scottish Protestant missionary: b. Dun, Forfarshire, 1815; d. 1868. He received his education at Aberdeen University and entered on the practice of law, which he soon abandoned to enter the missionary field in 1839. For about seven years he led great revivals throughout the British Isles, but set out for China in 1846. He was very successful, having adopted the native costume and manner of life and becoming a fluent speaker in the native tongue. Consult Burns, 'Memoir of William Chalmers Burns' (1870).

BURNS, William Wallace, American soldier: b. Coshocton, Ohio, 3 Sept. 1825; d. Beaufort, S. C., 19 April 1892. He was graduated from West Point in 1847. He served in the war with Mexico and also in the Union army during the Civil War, becoming major-general of volunteers. In 1865 he was brevetted brigadier-general and was for many years afterward in the Commissary Department at Washington, until 1889, when he retired, with the regular rank of colonel.

BURNSIDE, Ambrose Everett, American soldier: b. Liberty, Ind., 23 May 1824; d. Bristol, R. I., 13 Sept. 1881. He served an apprenticeship to a tailor, but received a nomination to West Point, where he was graduated in 1847. After serving some years in garrison duty, he left the army as first lieutenant in 1852, and from 1853 to 1858 was engaged in the manufacture of firearms at Bristol, R. I., during this period, in 1856, inventing the Burnside breech-loading rifle. On the outbreak of the Civil War (q.v.) in 1861, he returned to the army as colonel of volunteers, serving from May to August of that year as colonel of the Rhode Island Volunteers, and as such taking part in the first battle of Bull Run (q.v.). On 6 August he was promoted brigadier-general of volunteers and from October 1861 to January 1862 supervised the organization of the «Coast Division» of the Army of the Potomac. From January to July 1862 he commanded the Department of North Carolina; in February captured Roanoke Island, occupied Newbern, N. C., and took Fort Macon, Beaufort. He was raised to the rank of major-general of volunteers on 18 March 1862 and placed in command of the troops that subsequently constituted the 9th Army Corps. In July 1862 and again after the second battle of Bull Run (q.v.) he was offered the command of the Army of Virginia which, after the battle of Bull Run, had been merged into the Army of the Potomac, but each time declined the offer and served with the 9th Army Corps under McClellan. In this capacity he participated in the Maryland campaign (q.v.) against Lee, rendering important services in the battles of South Mountain and Antietam (qq.v.), in the latter action on 17 September commanding the left wing. On 10 November of that year he superseded General McClellan in command of the Army of the Potomac. On 13 December he crossed the Rappahannock and attacked General Lee near Fredericksburg, but was repulsed with a loss of over 10,000 men, and was soon after transferred to the Department of Ohio. In November 1863 he successfully held Knoxville against a superior force, and in 1864 he led a corps, under General Grant, through the battles of the Wilderness and Cold Harbor. Resigning in April 1865, he was elected governor of Rhode Island (1866–68), and United States senator in 1875 and 1881. Consult Poore, 'Life and Public Services of Ambrose E. Burnside' (Providence 1882); Woodbury, 'Major General Burnside and the Ninth Army Corps' (Providence 1867).

BURNSIDE, Helen Marion, English artist and poet: b. Bromley Hall 1844. She published a book of poems in 1864, which made her widely known. From 1880 to 1889 she was designer to the Royal School of Art Needlework. She has published 'The Lost Letter,' 'Tales for Children,' 'The Girl without a Penny' and many occasional contributions in prose and verse to leading magazines.

BURNSIDE, Ky., town in Somerset County on the South Fork River, and on the C. B. & C. R. and Cincinnati & Southern railroads. The chief industries are lumber manufactures and roller mills. Taxable property amounts to $800,000. Pop. 1,500.

BURNT OFFERING, one of the sacrifices enjoined on the Hebrew Church and nation. It is called, in their language, *olah,* from the root *alah,* to ascend, because, being wholly consumed, all but the refuse ashes, was regarded as ascending in the smoke to God. In the New Testament it is called *holokautōma,* meaning a whole burnt offering, an offering wholly burnt. In the Vulgate it is called *holocaustum,* which has the same meaning. Stated burnt offerings were presented daily, every Sabbath, at the new moon, at the three great festivals, on the day of atonement and at the feast of trumpets. Private ones might be presented at any time.

BURNT SIENNA, an ochreous earth known as sienna earth (*terra di Sienna*) submitted to the action of fire, by which it is converted into a fine orange-brown pigment used in both oil and water-color painting.

BURNT STONES, a kind of carnelian often met with in ruins. The red color displayed by holding it up to the light is believed to be the result of fire and artificial methods toward the same end have been tried with more or less success.

BURNT UMBER, a pigment of reddish-brown color obtained by burning umber, a soft earthy mixture of the peroxides of iron and manganese, deriving its name from Umbria in Italy.

BURNT WOOD WORK. See PYROGRAPHY.

BURNTISLAND, bŭrnt-ī'land, Scotland, a royal burgh and seaport of Fife, on the north shore of the estuary of the Forth, 7½ miles north by west of Edinburgh and five miles by steam ferry north of Granton. It is a favorite summer residence and bathing-place as well as a busy port. Its parish church dates from 1594, and close by is Rossend Castle, where Chastelard's indiscreet love affair with Mary Queen of Scots was followed by his execution. The harbor is capacious, of great depth and of easy access, and the docks are extensive and well equipped. Vegetable oil and oil-cake are made, and there are railway repairing works and a distillery. It unites with Kinghorn, Dysart and Kirkcaldy in sending a member to Parliament. Pop. 4,708.

BURPEE, Lawrence Johnston, Canadian author: b. Halifax, Nova Scotia, 5 March 1873. He entered the Canadian public service in 1890; in 1905 he was appointed librarian of the Carnegie Public Library, Ottawa. In 1912 he was appointed secretary of the Canadian section of the International Joint Commission. In addition to editorial work for the publications of the Canadian Archives and the Royal Society of Canada, contributions to various encyclopædias and 'Canada and Its Provinces,' he has published, among others, the following works: 'Bibliography of Canadian Fiction' (1904); 'The Search for the Western Sea' (1907), a notable contribution to the history of exploration; 'By Canadian Streams'; 'Songs of French Canada' (1909); 'Dictionary of Canadian History' (with A. G. Doughty); 'La Verendrye and the Western Sea' (1911); 'Canadian Humour' (1912); 'Among the Canadian Alps' (1914); 'Sandford Fleming, Empire Builder' (1915).

BURR, Aaron, American clergyman: b. Fairfield, Conn., 4 Jan. 1716; d. Princeton, N. J., 24 Sept. 1757. He was graduated at Yale and was settled as pastor of the Presbyterian Church of Newark, N. J. In 1748 he became president of the College of New Jersey, now Princeton University, succeeding the first president, Dickinson, who held office only a few months. He married a daughter of Jonathan Edwards, and was the father of Aaron Burr (q.v.), third Vice-President of the United States. He published a Latin grammar, known as the 'Newark Grammar,' and 'The Supreme Divinity of Our Lord Jesus Christ.'

BURR, Aaron, American statesman: b. Newark, N. J. (son of the preceding), 6 Feb. 1756; d. Port Richmond, Staten Island, 14 Sept. 1836. Before he was three years old his parents died, leaving him a considerable estate. He entered the sophomore class of Princeton College in 1769, and was graduated in 1772. At the outbreak of the Revolution Burr enlisted as a private and joined the force before Boston. He volunteered for the expedition against Canada and took part in the attack upon Quebec. For this service he was raised to the rank of major. As aide-de-camp to General Putnam, Burr was engaged in the defense of New York, and shortly after (1777) was promoted lieutenant-colonel with the command of his regiment, the colonel being a civilian. He was at Valley Forge, and distinguished himself at the battle of Monmouth, where he commanded a brigade in Lord Stirling's division. During the winter of 1778 he was stationed in Westchester County, N. Y., but early in the following spring he resigned his commission, partly on account of ill health, and partly through disappointment at not being more rapidly promoted. Burr belonged to the Lee and Gates factions; he always affected to despise the military talents of General Washington; and it is not improbable that these circumstances interfered with his professional career. In 1782 he was admitted to the bar in Albany, and in July of the same year he married Mrs. Provost, the widow of a British officer who had died in the West Indies. In 1783 he began to practise in New York, and soon obtained a lucrative business. In politics his success was rapid and brilliant. In 1784 he was elected to the State legislature; he was appointed attorney-general of New York in 1789 and United States senator in 1791. While in the Senate several influential members of Congress recommended him for the mission to France, but Washington, with marked emphasis, refused to appoint him. He left the Senate in 1797, and the following year was returned to the State legislature. Some aspersions upon his conduct while in that body, which were thrown out by John B. Church, led to a duel between Burr and that gentleman, in which, however, neither party was injured. Burr was very efficient in the presidential canvass of 1800. To his efforts may be attributed the success of the Republicans in New York, upon the action of which State the result in the Union depended. On account of the prominence he thus obtained the friends of Jefferson brought him forward for the Vice-Presidency. An equal number of votes having been thrown for Jefferson and Burr in the Electoral College, the election of a President devolved upon the House of Representatives. Most of the Federal members, taking advantage of the singular turn in affairs, supported Burr. The contest lasted several days. Upon the 36th ballot Jefferson was chosen President, and, in accordance with the provisions of the constitution at that time, Burr became Vice-President. His conduct in permitting himself to be used by his political opponents in order to defeat the candidate of his party, whom he himself had supported, dissolved his connection with the Republicans and destroyed his political influence. The Federalists nominated him for governor of New York in 1804. Some of the leading men of that party refused to support him, and he was defeated. The contest was bitter and led to a duel between Burr and Alexander Hamilton (q.v.), 11 July 1804, in which the latter was killed. Burr was compelled to give up his residence in New York. After his retirement from the Vice-Presidency in April 1805, he made a journey to the Southwest. His conduct gave rise to the suspicion that he was organizing an expedition to invade Mexico, with the purpose of establishing an empire there which should embrace some of the southwestern States of the Union. He was arrested in Mississippi and taken to Richmond, Va., for trial upon an indictment for treason. After a protracted investigation before Chief Justice Marshall the prosecution was abandoned and Burr was acquitted in September 1807. In 1808 he went to Europe, expecting to get means to carry out his Mexican design. He was disappointed; and after being abroad four years, part of the time in extreme poverty, he returned to America in 1812. He resumed his profession in New York, but never regained his former position at the bar. In 1833 he married Mme. Jumel, a wealthy widow, but they soon separated. Mr. Burr had but one child, the accomplished Theodosia Allston. (See BURR, THEODOSIA). In person he was below the medium height, but his manners and presence were very attractive. He was an adroit, persevering but not a great lawyer. He cannot be said to have been an orator, yet he was an effective and ready speaker. It has been usual to regard Burr as a brilliant, and even a great, man, who was led astray by moral obliquity. In regard to the looseness of his principles, there can be no doubt; but there is a growing tendency to relieve his name of much of the odium that formerly attached to it. He survived nearly all his contemporaries. His body was laid beside his father's at Princeton. Consult Adams, 'History of the United States' (9 vols., New York 1889–91); Davis, 'Memoirs of Aaron Burr' (2 vols., New York 1836); Orth, S. R., 'Five American Politicians: A. Burr' (Cleveland 1906); Parton, 'Life of Aaron Burr' (New York 1858); Schouler, 'History of the United States of America under the Constitution' (6 vols., last ed., New York 1899); Tompkins, 'Burr Bibliography' (Brooklyn 1892); Todd, 'The True Aaron Burr' (ib. 1902); McCaleb, 'The Aaron Burr Conspiracy' (ib. 1903).

BURR, Edward, American soldier: b. Boonville, Mo., May 1859. He studied at Washington University 1874–78, and at the United States Military Academy 1878–82, and on graduation at the latter was assigned to the corps of engineers with the rank of second lieutenant. He was promoted first lieutenant in 1883 and captain in 1894; and as lieutenant-colonel of volunteers commanded the battalion of engineers in the campaign against Santiago de Cuba in June-July 1898. He was appointed colonel 2 March 1912. He is a member of the American Society of Civil Engineers.

BURR, Enoch Fitch, American mathematician and clergyman: b. Green's Farms, Fairfield County, Conn., 21 Oct. 1818; d. 1907. He was graduated at Yale in 1839, and became pastor of the Congregational Church in Lyme, Conn., in 1850. From 1868 till his death he was a lecturer at Amherst College. Among his works are 'A Treatise on the Application of the Calculus to the Theory of Neptune' (1848); 'A Song of the Sea' (1873); 'Aleph, the Chaldean' (1891); 'Pater Mundi' (1869); 'Ad Fidem' (1871); 'Ecce Terra' (1884); 'Celestial Empires' (1885); 'Universal Beliefs' (1887); 'Supreme Things in their Practical Relations' (1889); besides several historical stories.

BURR, George Lincoln, American historian: b. Oramel, N. Y., 30 Jan. 1857. He was educated at Cornell University, where he was graduated in 1881, and studied also at Leipzig, the Sorbonne and at Zürich. He became professor of ancient and mediæval history at Cornell in 1888 and in 1898 was appointed librarian of the White Historical Library. In 1896–97 he served as historical expert of the Venezuelan Boundary Commission. He has made an especial study of the history of superstition. He has published 'The Literature of Witchcraft' (1890) and 'The Fate of Dietrich Flade' (1891). He edited the 'Century Historical Series' and is a member of the editorial staff of the *American Historical Review*.

BURR, Theodosia (MRS. JOSEPH ALLSTON), daughter of Aaron Burr, b. New York 1783; d. 1813. She was carefully educated and became very accomplished, showing particular linguistic talent. After the death of Mrs. Burr she presided over her father's household until her marriage in 1801 to Governor Allston of South Carolina. Her correspondence with her father after her removal to the South is of great interest and shows continued devotion to his interests. Her beauty, brilliant personality and relationship to the famous statesman drew public attention to her, especially during her father's trial, and had the effect of enlisting the public sympathy on his behalf. In 1812 she sailed from Charleston in the *Patriot* for New York, but the vessel was never heard from and was believed to have been lost in the storm or sunk by pirates.

BURR, William Hubert, American educator: b. Watertown, Conn., 14 July 1851. He was graduated at Rensselaer Polytechnic Institute 1872; was employed by the Wrought Iron Bridge Company of New York, and later on the water supply and sewerage systems of Newark, N. J. He was assistant professor and later professor of rational and technical mechanics at Rensselaer Polytechnic Institute 1876–84; became assistant engineer of the Phœnix Bridge Company 1884, and subsequently its general manager; was professor of engineering in the Lawrence Scientific School of Harvard

University 1892–93; consulting engineer to the New York city department of public works 1893–95, of parks and of docks 1895–97, and later of bridges. Since 1893 he has been professor of civil engineering at Columbia, and in 1904 became a member of the Isthmian Canal Commission. He is author of ‘The Stresses in Bridge and Roof Trusses’ (1879); ‘Arched Ribs and Suspension Bridges’ (1913); ‘Elasticity of the Materials of Engineering’ (1883); ‘The Theory of Masonry Arches,’ ‘Ancient and Modern Engineering and the Isthmian Canal’ (1902), etc.

BURRAGE, Henry Sweetser, American clergyman: b. Fitchburg, Mass., 7 Jan. 1837. He was graduated from Brown University, 1861, and entering the 36th Massachusetts as a private, rose to the rank of captain and brevet-major of volunteers. After the war he resumed his studies, graduated at Newton Theological Institution, 1867, was at the University of Halle, Germany, 1868–69, and became a Baptist clergyman in 1869. He was pastor at Waterville, Me., 1869–73; editor of *Zion's Advocate,* 1873–1905; recording secretary of the American Baptist Union, 1876–1904; recorder Maine Commandery, Loyal Legion, 1889–1912; chaplain National Soldiers' Home, 1905–12; trustee Colby College, 1881–1905; Newton Theological Institution, 1889–1906; fellow of Brown University since 1901. He has edited ‘Brown University in the Civil War’ (1868); ‘Henry W. Longfellow's 75th Birthday’ (1882); ‘History of the 36th Regiment of Massachusetts Volunteers’ (1884); and has written ‘The Act of Baptism in the History of the Christian Church’ (1879); ‘History of the Anabaptists in Switzerland’ (1882); ‘Rosier's Relation of Waymouth's Voyage to the Coast of Maine in 1605’ (1887); ‘Baptist Hymn Writers and their Hymns’ (1888); ‘History of the Baptists in New England, (1894); ‘History of the Baptists in Maine’ (1904); ‘Gettysburg and Lincoln’ (1906); ‘Early English and French Voyages’ (1906); ‘Maine at Louisburg in 1745’ (1910); ‘The Beginnings of Colonial Maine’ (1914.

BURRARD INLET, an inlet at the southwest corner of British Columbia, a little north of the mouth of the Fraser River. It is nine miles long, is one of the finest harbors on the Pacific coast, and has Vancouver, the terminus of the Canadian Pacific Railway, on its southern shore.

BURRELL, David James, American clergyman and author: b. Mount Pleasant, Pa., 1 Aug. 1844. He was graduated at Yale in 1867 and at Union Theological Seminary in 1870. He spent four years in mission work at Chicago and thereafter was successively pastor at Dubuque, Iowa, 1876–87, Westminster Church, Minneapolis, 1887–91, and the Marble Collegiate Church, New York. He has published ‘Religions of the World’ (1891); ‘Gospel of Gladness’ (1892); ‘The Early Church’ (1897); ‘The Religion of the Future’ (1894); ‘The Wonderful Teacher’ (1902); ‘Teachings of Jesus’ (1904); ‘The Lure of the City’ (1908); ‘The Cloister Book’ (1909); ‘In David's Town’ (1910); ‘At the Gate Beautiful’ (1911); ‘The Home Sanctuary’ (1911); ‘The Gateway of Life’ (1912); ‘The Old-Time Religion’ (1913) ‘The Sermon’ (1913); ‘The Church in the Upper Room’ (1913); ‘We Would See Jesus’ (1914); and ‘The Apostles' Creed’ (1915); ‘Why I Believe the Bible’ (1917).

BURRELL, Martin, Canadian legislator: b. England 1858. He was educated at Saint John's College, Hurstpierpoint, Sussex, and came to Ontario in 1886, where for 14 years he engaged in fruit growing near Niagara. He removed to British Columbia in 1900, and continued at fruit growing and began to take an interest in local politics. He became widely known as an authority on horticulture, and in 1907 the government of British Columbia appointed him fruit commissioner and sent him as lecturer to England. In 1908 he was elected as a Conservative to the House of Commons and re-elected in 1911. In the latter year he was appointed Minister of Agriculture in the Borden administration.

BURRIANA, Spain, town in the province of Castellón, eight miles south of the town of Castellón, on the river Seco, and about one mile from the Mediterranean. It is situated in a fertile region. Agriculture and fishing are the principal industries and it has a trade in oil, wine and fruit. Pop. 14,243.

BURRILL, Thomas Jonathan, American naturalist: b. Pittsfield, Mass., 25 April 1839. He was graduated at the Illinois State Normal University in 1865, and in 1867 was botanist of Powell's first Rocky Mountain Expedition. Since 1868 he has been a member of the faculty of the University of Illinois and has held the following offices in the university: Professor of botany and horticulture since 1868; dean of the College of Science, 1877–84; vice-president since 1879; acting president, 1889–90, 1891–94 and 1904; dean of the Graduate School since 1894. The degree of LL.D. was conferred upon him in 1893 by the Northwestern University. He is a member of several American and foreign scientific societies, and is well known from his writings under more than 100 titles, mostly upon the parasitic diseases of plants, bacteriology, microscopy, fruit growing, forestry, landscape gardening and modern education.

BURRILLVILLE, R. I., town of Providence county, 24 miles northwest of Providence, on the New York, New Haven & Hartford Railroad. It manufactures woolen goods. Nearby is Wallum Lake, a popular summer resort. Burrillville is governed by a town council, chosen every year. Pop. 7,878.

BURRITT, Elihu («THE LEARNED BLACKSMITH»), American reformer: b. New Britain, Conn., 8 Dec. 1811; d. 7 March 1879. The son of a shoemaker, he was educated in the common schools of his native village, and at the age of 16 was apprenticed to a blacksmith. An early conceived project of reading the Scriptures in their original language led him to philological studies in the intervals of labor, and by diligence and a remarkable facility he was soon able to understand works in several languages. He removed to Worcester to take advantage of the library of the Antiquarian Society there, and while still plying his trade became acquainted with the principal ancient and modern languages. In 1846 he went to England, where he formed the «League of Universal Brotherhood,» whose object was «to employ all legitimate means for the abolition of war throughout the world.» He was constantly engaged in writing and lecturing, and took a prominent part in all the European peace congresses. He returned to America in 1853. He was consular agent at Birmingham, 1865–68. The promotion of temperance, cheap ocean postage and the abolition of American slavery were leading objects of his continued exertions. His principal publications are ‘Sparks from the Anvil’ (1848); ‘Thoughts and Things at Home and Abroad’ (1854); ‘Chips from Many Blocks,’ etc.

BURROUGH, BOROUGH, BURROWE, or BORROWS, Stephen, or Stefan, English navigator: b. Devonshire, 23 Sept. 1525; d. 1584. In 1553 he took a very active part in the expedition dispatched from the Thames under Sir Hugh Willoughby to look for a northwest passage to Cathay and India. There were three ships in the expedition, one of which was under the command of Burrough, who got separated from the other craft during a storm. He continued the voyage alone, reaching Nova Zembla and the island of Waigatz. In 1556 he made a second voyage into the same regions and in 1560 he took charge of another expedition to Russia. In 1563 he was appointed chief pilot and one of the four masters of queen's ships in the Medway, a position which he held for many years. Burrough, who reached 70° 30' N. on one of his Russian expeditions, was looked upon, in his day, as a noted explorer. He seems to have been a very active and intelligent sailor.

BURROUGHS, George, American clergyman: d. Salem, Mass., 19 Aug. 1692. He was graduated at Harvard College in 1670, was a preacher at Falmouth, now Portland, Me., in 1676, and at Salem in 1680. In consequence of some dispute with his people he returned to Portland in 1683, but, when that town was destroyed by the Indians in 1690, came back to Salem. Though a person of unblemished character, he became one of the victims of accusation by the confessing witches. It was testified that two of his wives had appeared to the witnesses, saying that he was the cause of their death, and threatening, if he denied it, to appear in court. He was also accused of performing feats of extraordinary strength by diabolical assistance, such as carrying a barrel of molasses, holding out a gun by a finger placed in the muzzle, and of having «tortured, afflicted, pined, consumed, wasted and tormented» one Mary Wolcott. Although he asserted his innocence so as to draw tears from the spectators, and recited the Lord's Prayer, which it was supposed no witch could repeat without mistake, he was condemned and executed.

BURROUGHS, John, American essayist and literary naturalist: b. Roxbury, N. Y., 3 April 1837. In his youth he taught school for about 10 years; he began early to write for the magazines; in 1863 he became clerk in the Treasury Department at Washington, D. C., where he worked for 10 years, carrying on his literary activities simultaneously. Later he became a national bank examiner. In 1873 he built «Riverby,» his home at West Park, on the Hudson, where he has since lived, devoting himself to fruit culture, nature study and literature. In 1862 Mr. Burroughs wrote the poem, ‘Waiting,’ by which he is perhaps more widely known than by any of his books. His first book, ‘Walt Whitman, Poet and Person,’ was written in 1867, he being the first person of note in the United States to give public recognition of Whitman. His later book on the ‘Good Gray Poet,’ ‘Whitman, a Study,’ was published in 1896, and was the result of many years of comradeship with the poet. Mr. Burroughs has gathered most of the harvest for his nature books near at home, either at «Riverby,» in his bark-covered study, or in the region of «Slabsides,» his retreat back from the Hudson, near West Park, or in later years at «Woodchuck Lodge, on the farm in the Catskills where he was born. He has, however, wandered away from these haunts occasionally, as his books testify — to many parts of the United States, to Bermuda, the West Indies, the Canadas, twice to Europe, on the Alaskan expedition of 1899 with E. H. Harriman, in the Yellowstone in 1903 with President Roosevelt, through the Southwest and Yosemite with John Muir, in 1909, and also to Hawaii. The personal element is very marked in his writings, and the charm of his easy familiar style, with his remarkable observation and interpretation of nature, has done much to popularize the study of nature in our day, while his work on literary criticism, his character studies and his philosophical essays are eagerly welcomed by lovers of good literature. His books, with the dates of their publication, are ‘Walt Whitman, Poet and Person’ (1867); ‘Wake Robin’ (1871); ‘Winter Sunshine’ (1875); ‘Birds and Poets’ (1877); ‘Locusts and Wild Honey’ (1879); ‘Pepacton’ (1881); ‘Fresh Fields’ (1884); ‘Signs and Seasons’ (1886); ‘Indoor Studies’ (1889); ‘Riverby’ (1894); ‘Whitman, a Study’ (1896); ‘The Light of Day’ (1900); ‘Literary Values’ (1902); ‘Life of Audubon’ (1902); ‘Far and Near’ (1904); ‘Ways of Nature’ (1905); ‘Bird and Bough’ Poems (1906); ‘Camping and Tramping with Roosevelt’ (1907); ‘Leaf and Tendril’ (1908); ‘Time and Change’ (1912); ‘The Summit of the Years’ (1913); ‘The Breath of Life’ (1915); ‘Under the Apple Trees’ (1916). Mr. Burroughs has also edited a volume of nature poems, ‘Songs of Nature’ (1901); and several books have been compiled from his works — ‘Birds and Bees’; ‘Afoot and Afloat’; ‘Sharp Eyes’; ‘Little Nature Studies’; ‘Squirrels and Other Fur Bearers’; ‘A Year in the Fields; ‘In the Catskills’; and ‘Bird Stories from Burroughs.’

BURROWING BEE, any of the species that burrow in the ground and form their nests there. Among the principal kinds are the *Adrena* and *Halictus*. See BEE.

BURROWING OWL, a small owl (*Speotyto cunicularia*) common on the open plains of both North and South America, where it makes its nest in burrows. It is mottled gray in color, has very long legs, scantily feathered and stands erect upon them in a manner different from that of owls generally. It is gregarious, and is especially prevalent on the North American plains in the «towns» of the prairie dogs; and in South America it lives with the vizcachas and cavies, and is thought to warn them by its excited notes whenever an enemy approaches. Among the many unowl-like traits of this curious little exile from the woods is its cry, which has no resemblance to the ordinary hoot of an owl, but more nearly resembles the chattering of a cuckoo. This owl makes its home wherever it can: in some abandoned burrow of a ground-squirrel or other animal, but, failing this, it digs a little cave-like hole of its own, which it furnishes with a bed of soft materials, whereon are laid about eight globular white eggs. The food of these owls consists almost entirely of insects and mice. Consult Coues, E., 'Birds of the Northwest' (Washington 1874); Sclater and Hudson, 'Argentine Ornithology' (London 1888).

BURROWS, William, American naval officer: b. near Philadelphia, Pa., 6 Oct. 1785; d. at sea, 5 Sept. 1813. He served in the war with Tripoli and commanded the sloop *Enterprise* in its successful action with the British brig *Boxer* off the coast of Maine. Both Burrows and the British commander were killed in the fight, and they were buried side by side at Portland. Congress struck a medal in honor of the victory and its hero.

BURSA, in anatomy, a sac containing a clear fluid between surfaces which move one upon the other. There are two varieties — mucous, or simple cavities between the skin and bony protuberances, as at the knee, and synovial, or sacs between the muscles or tendons and bony protuberances.

BURSAR, or BURSARY, an endowment in one of the Scotch universities, corresponding to an exhibition in an English university, and intended for the support of a student during his ordinary course and before he has taken a degree in the faculty in which he holds the bursary. Each of the four universities of Scotland has a greater or smaller number of bursaries. As yet the University of Aberdeen is better provided than any of the others with this class of endowments. Bursaries are in the gift sometimes of the Senatus Academicus of the university to which they belong, sometimes of the town council of the city in which the university is situated and sometimes of private individuals. With regard to the manner in which they are bestowed, some are obtained after competitive examination and others are given by the patrons for special reasons. As the former method of bestowing them is found to be the more beneficial in its results, it is gradually becoming the prevailing one, as at Aberdeen it has always been. Bursaries which are in the gift of the Senatus Academicus are all bestowed in this way. In a monastery, the bursar was the one who held and disbursed the income. In the sense of subtreasurer, the term is still used in English universities and in Harvard University and elsewhere. In England it is also applied to candidates for the elementary school-teaching profession receiving maintenance from the state.

BURSCHENSCHAFT, boor-shen-shäft (Ger.), an association formed in 1815 among students in German universities for the liberation and union of Germany.

BURSERACEÆ (named after the botanist, Joachim Burser), a family of dicotyledonous plants, of which there are about 13 genera and 300 species. The family belongs to the tropics and yields varieties of balsams and resins.

BURSITIS, inflammation of a bursa, most commonly caused by injury. The well-known housemaid's knee is a good example of bursitis. See JOINTS, DISEASES OF.

BURSLEM, England, market town and municipal borough in Staffordshire, within the parliamentary borough of Hanley, in «The Potteries.» It is the oldest of the six towns forming the potteries and is known as the «Mother of the Potteries.» It is well built, chiefly of brick; has electric tramways, a fine town-hall, covered market, public baths, hospital and the Wedgwood Institute, comprising a free library, a museum and a school of art, erected in honor of Josiah Wedgwood, who was born at Burslem in 1730. The building is an excellent exemplification of the structural application of ceramics. It has extensive manufactures of china and earthenware, and carries on coal mining. Pop. 41,556.

BURT, Mary Elizabeth, American educator: b. Lake Geneva, Wis. She studied at Oberlin College and entered the teaching profession. For three years she was a member of the Chicago board of education. Later she undertook editorial work and lecturing. She edited 'Little Nature Studies for Little People'; 'Seed Thoughts from Robert Browning,' etc.; has contributed frequently to periodical literature and is the author of 'Browning's Women' (1889); 'Literary Landmarks' (1889); 'The World's Literature' (1890); 'German Iliad (Siegfried)' (1892); 'Stories from Plato and Other Classic Writers' (1893), and collaborated in writing 'The Literary Primer' (1901); 'The Boy General' (1901); 'Poems Every Child Should Know' (1904); 'Prose Every Child Should Know' (1907); 'Adventures of Pinocchio' (1908).

BURT, Thomas, English labor leader: b. Northumberland, 12 Nov. 1837. He began work in the coal mines at 10 years of age. He early became immersed in the labor movement; was secretary for the Northumberland miners from 1865–1913; has represented Morpeth as a Liberal since 1874; was parliamentary secretary of the Board of Trade from 1892–95, and in 1906 was made a privy councillor.

BURT, William, American Methodist Episcopal clergyman: b. Cornwall, England, 23 Oct. 1852. He was graduated at Wesleyan University in 1879 and at Drew Theological Seminary in 1881. He spent five years in churches at Brooklyn, N. Y., and in 1886 was appointed presiding elder of the district of Milan in the Italian conference. He was in Rome from 1890 to 1904, and there founded schools and a publishing house. In 1904 he was made a bishop. His work has been looked upon with disfavor by the Papal Curia because of the proselyting methods adopted. He has published 'Europe and Methodism' (1909).

BURTON, Edwin Hubert, English clergyman and writer: b. London, 12 Aug. 1870. He was educated at Ware, Ushaw and Oscott; studied law 1888–93; solicitor, High Court of Justice, 1893. He was ordained a Catholic priest in 1898; was curate at Saint Mary and Michael's, London, 1898, when he was appointed to the staff of Saint Edmund's College, Ware, becoming vice-president in 1902, professor of Church history in 1907 and Weld lecturer in ascetic theology in 1909. He is a fellow of the Royal Numismatic Society, the Royal Historical Society and of the East Herts Archæological Society. He contributed about 300 articles to 'The Catholic Encyclopedia,' to the *Dublin Review*, and is editor of *The Edmundian*. He has published 'Catalogue of Books in the Libraries at Saint Edmund's College, Old Hall, printed in England, and of Books written by Englishmen printed Abroad to the Year 1640' (1902); 'Life and Times of Bishop Challoner' (2 vols., London 1909); 'Meditations on the Passion by Richard Rolle, Hermit of Hampole, done into Modern English' (London 1906); co-author of 'Biographies of English Catholics in the Eighteenth Century'; 'Lives of the English Martyrs' (Vol. I, London 1913).

BURTON, Ernest De Witt, American Biblical scholar: b. Granville, Ohio, 4 Feb. 1856. He was graduated at Denison University in 1876 and at Rochester Theological Seminary in 1882, and went to Europe for further study in Leipzig and Berlin. From 1882–83 he taught in the Rochester Theological Seminary and from 1883–92 in the Newton Theological Institution, first as associate professor and later a professor of New Testament interpretation. In 1892 he was appointed head professor of New Testament interpretation in the University of Chicago. Among his works are 'Syntax of the Moods and Tenses in New Testament Greek'; 'Harmony of the Gospels for Historical Study,' and 'Handbook of the Life of Christ' (in collaboration with W. A. Stevens); 'Records and Letters of the Apostolic Age'; 'Handbook of the Life of Paul'; 'Constructive Studies in the Life of Christ' in collaboration with Shailer Mathews (1901); 'Principles and Ideals of the Sunday-School' (1903); 'Biblical Ideas of Atonement' (1909); 'Studies in Mark' (1904), and 'Some Principles of Literary Criticism and their Application to the Synoptic Problem' (1904). In 1892 he became associate editor of the *Biblical World* and in 1897 of the *American Journal of Theology.*

BURTON, John Hill, Scottish historian: b. Aberdeen, 22 Aug. 1809; d. 10 Aug. 1881. He was educated at the grammar school and Marischal College in that city. He studied law and was admitted to the bar in 1831. He never succeeded in gaining much practice and soon turned his attention to literature, contributing to the *Westminster*, the *Edinburgh* and *North British Reviews*; acted for a short period as editor of the *Scotsman*, and committed that journal to a free-trade policy. With Sir John Bowring he edited Bentham's works, as well as an illustrative 'Benthamiana,' with the aim of making more widely known the opinions of the great apostle of utilitarianism and radicalism. His first original work of importance was the 'Life and Correspondence of David Hume' (1846), followed next year by the 'Lives' of Lord Lovat and Duncan Forbes of Culloden. In 1849 he published his 'Political and Social Economy'; in 1852 he compiled 'Narratives from Criminal Trials in Scotland.' He commenced in 1853 the publication of his chief work, the 'History of Scotland,' with two volumes covering the period from the revolution of 1688 to the extinction of the last Jacobite rebellion in 1746. This was afterward completed by seven volumes commencing with Agricola's invasion and ending with the revolution of 1688. A second edition of the complete history was published in eight volumes in 1873. A series of literary and historical sketches contributed to *Blackwood's Magazine* formed the basis of two of his best-known books, 'The Scot Abroad' and 'The Book Hunter.' His last important historical work was the 'History of the Reign of Queen Anne' (1880). In 1854 Mr. Burton was appointed secretary to the Scottish Prison Board, and he continued his connection with this department as a commissioner of prisons until his death. The success of his 'History of Scotland' brought him the appointment of historiographer royal for Scotland. Consult article in *Blackwood's Magazine* for September 1881, and the memoir by his widow prefixed to 'The Book Hunter.'

BURTON, Lewis William, American clergyman: b. Cleveland, Ohio, 9 Nov. 1852. He was first honor graduate in 1873 of Kenyon College, with A.B., later A.M. and D.D. from University of the South. He was graduated from the Philadelphia Divinity School 1877; ordained deacon 1877 and priest in 1878, in the Protestant Episcopal Church; was successively in charge of parishes in Cleveland, Richmond, Va., and Louisville. He was consecrated bishop of the diocese of Lexington (eastern half of Kentucky) 1896. He has published sermons, Episcopal charges and addresses and was author of 'Annals of Henrico Parish' in J. S. Moore's 'Virginiana' (1904). He traveled abroad in 1880 and was a member of the Lambeth conferences of the bishops of the Anglican Communion in 1897 and 1908. He is a member of the Phi Beta Kappa Society and of the Society of Colonial Wars; a trustee of Kenyon College and of the University of the South. He is Episcopal head of Margaret College, Versailles, Ky., and of Saint John's Collegiate Institute and Industrial School, Corbin, Ky.

BURTON, Marion Le Roy, American clergyman and educator: b. Brooklyn, Iowa, 30 Aug. 1874. He was educated at Carleton College and at Yale, receiving the degree of Ph.D. from the latter institution in 1907. He became assistant professor at Yale for one year and in 1908 was in charge of the church of the Pilgrims, Brooklyn. After a year's travel in Europe, he was inaugurated president of Smith College, Northampton, Mass., in 1910. He has written 'The Problem of Evil' (1909); 'The Secret of Achievement' (1913); 'Our Intellectual Attitude in an Age of Criticism' (1913); 'Life Which is Life Indeed' (1914); 'First Things' (1915); also various addresses and reports.

BURTON, Richard, American poet and journalist: b. Hartford, Conn., 14 March 1859. He was graduated from Trinity College, Hartford, and took a degree at Johns Hopkins University in 1887. He was managing editor of the *Churchman* 1889–90, literary editor of the Hartford *Courant* 1890–97 and professor of English literature in the University of Minnesota 1893–1902; now in charge of the English department of the University of Minnesota. He has published 'Dumb in June' (1895); 'Memorial Day' (1897); 'Literary Likings' (1898);

‘Lyrics of Brotherhood’ (1899); ‘Song of the Unsuccessful’ (1900); ‘Life of Whittier’ (1900); ‘Forces in Fiction’ (1902); ‘Message and Melody’ (1903); ‘Literary Leaders of America’ (1904); ‘Three of a Kind’ (1908); ‘Masters of the English Novel’ (1909); ‘A Midsummer Memory’ (1910); ‘The New American Drama’ (1913); ‘How to See a Play’ (1914).

BURTON, Sir Richard Francis, English traveler, linguist and author: b. Barham House, Hertfordshire, 19 March 1821; d. Trieste, Austria, 20 Oct. 1890. He was educated at Oxford with the intention of entering the Church, but in deference to his own urgent request his father obtained a commission for him in the East India Company's service. He joined the army in 1842, served for some years in Sind under Sir C. Napier, explored the Neilgherry Hills, published an important work on Sind and acquired a complete knowledge of the Persian, Afghan, Hindustanee and Arabic languages. Returning to England in 1851, he soon afterward set out to explore Arabia, disguised as an Afghan pilgrim, and published on his return a ‘Personal Narrative of a Pilgrimage to El-Medinah and Mecca’ (1855) as the result of this daring adventure. His next expedition was into the Somali country in East Africa, from whence he proceeded to the Crimea, where he was chief of the staff of General Beatson, and organized the irregular cavalry. After peace was proclaimed, Burton set out in 1856 along with Captain Speke to explore the lake region of central Africa. The expedition was absent three years, and during that time the great Lake Tanganyika was discovered by Burton. Subsequently he made a journey in the Western States of North America and published an account of the Mormon settlement at Utah in his ‘City of the Saints.’ In 1861 he married, and he received the same year an appointment as consul at Fernando Po. While fulfilling his duties there he explored the Bight of Biafra, visited the Kamerun Mountains and conducted a dangerous mission to the King of Dahomey. Afterward he was transferred to the consulate of Santos in Brazil, and here he explored his own province, visited the Argentine Republic, crossed the continent to Chile and Peru, returned home after exploring the Pacific coast and published his ‘Explorations of the Highlands of the Brazil.’ He was now (1871) made consul of Damascus but was soon recalled, and in the following year, after a journey to Iceland, an account of which he wrote, he was appointed consul at Trieste. While occupying this position he led two expeditions into Midian (1876–78), and in company with Commander Cameron he conducted an expedition into the gold-producing country behind the Gold Coast. He remained English consul at Trieste until his death. In his latter years his services to geographical science were acknowledged by the gold medals of the French and English Geographical societies, while in 1886 his services to his country were tardily recognized by the honor of K.C.M.G. Besides the books of travel already mentioned, he was the author of many others, such as ‘Sind, or the Unhappy Valley’ (1851); ‘Goa and the Blue Mountains’ (1851); ‘Falconry in the Valley of the Indus’ (1852); ‘First Footsteps in East Africa’ (1856); ‘The Lake Regions of Equatorial Africa’ (1860); ‘Abeokuta, or an Exploration of the Kamerun Mountains’ (1863); ‘Narrative of a Mission to the King of Dahomey’ (1864); ‘The Nile Basin’ (1864); ‘Vikram and the Vampire’ (1869); ‘Zanzibar’ (1872); ‘Gorilla Land’ (1875); ‘Ultima Thule, or a Summer in Iceland’ (1875); ‘Etruscan Bologna’ (1876); ‘Sind Revisited’ (1877), and ‘The Gold Mines of Midian’ (1878). In 1885–88 he published a remarkable literal translation of the ‘Arabian Nights’ entitled ‘Ten Thousand Nights and a Night,’ on which his reputation is firmly established. His manuscript translation, with notes, from the Arabic of ‘The Scented Garden,’ of great value to scholars, was burned by his widow, who deemed it an immoral work. Consult ‘Lives’ by Hitchman (1887), Lady Burton (1893), Stisted (1897), Wright (2 vols., 1906).

BURTON, Robert, English clergyman and author: b. Lindley, Leicestershire, 1577; d. 1640. He was educated at Oxford, took orders and became rector of Seagrave in Leicestershire. His learning, which was varied and extensive, is copiously displayed in the ‘Anatomy of Melancholy, by Democritus Junior,’ first published in 1621 and repeatedly reprinted. He was a man of integrity and benevolence but subject to strange fits of hypochondriac melancholy which rendered his conduct flighty and inconsistent. He is reputed to have undertaken the composition of his ‘Anatomy of Melancholy’ with a view to the dissipation of his morbid feelings. Among those who have been most deeply indebted to Burton is Sterne, as may be seen in his ‘Tristram Shandy.’ See Anatomy of Melancholy.

BURTON, Theodore Elijah, American statesman: b. Jefferson, Ohio, 20 Dec. 1851. He received his education at Ohio College and at Oberlin; entered the practice of law, which he later abandoned for the political field. In 1889–91 he was in Congress and again in 1895–1909. He was re-elected in 1909–11 but resigned to become senator. While in the House he rendered important services as chairman of the Committee on Harbors and Rivers. He served as delegate to the Republican conventions of 1904 and 1908, nominating William H. Taft to the Presidency at the latter. In 1913 he became chairman of the senatorial Committee on Canadian Relations and has also been president of the American Peace Society. His published works are ‘Financial Crises and Periods of Commercial and Industrial Depression’ (1902); ‘Corporations and the State’ (1911); ‘Life of John Sherman’ (1906).

BURTON, a special form of tackle, known either as top burton or sail burton. The former are used aboard ship to support the yards when these are rigged for hoisting heavy loads; the latter are used to hoist sails up to the yard where they are to be bent. They consist of a guide-block, fastened to the under purchase-block and traveling on the hauling line. They help keep the tackle straight and prevent the sail from yawing as it is hoisted aloft. See Tackle.

BURTON-UPON-TRENT, England, a municipal and county borough in Staffordshire, 11 miles southwest of Derby, on the north bank of the Trent, in a low, level situation. It is substantially built. Malting and iron-founding are carried on to a considerable extent, but it is chiefly celebrated for its excellent ale, of which vast quantities are made for both home consumption and exportation. For nearly three centuries Burton ale has been known and celebrated, but the latter-day development of the trade dates from the opening of the Midland Railway in 1839. There are about 30 breweries at work, giving employment in the various departments of the trade to about 5,000 men. The largest brewing establishments are those of Messrs. Bass & Co. and Messrs. Allsopp, the former of which covers considerably more than 500 acres of ground, brews 1,400,000 barrels of ale and stout annually and employs 3,000 men. Contrary to common usage, the brewers employ hard water obtained from wells instead of soft water. There are in all about 50 places of worship in the town, which also possesses a grammar school, girls' high school, almshouses, a dispensary and infirmary, a public library and reading-rooms, school of science and art, handsome public baths, etc. A bridge of 34 arches, built in pre-Norman times, was replaced in 1864. Pop. 48,266.

BURTSCHEID, bėrt'shīd, Germany, southern suburb of Aix-la-Chapelle, and until 1897 an independent municipality of the Rhine province. It is noted for its thermal springs and has manufactures of iron, steel, needles and woolen goods. The woolen industry is the largest of all.

BURTSELL, Richard Lalor, American clergyman: b. New York, 14 April 1840; d. Kingston, N. Y., 4 Feb. 1912. He studied in Rome and was ordained to the priesthood in 1862. After returning to the United States and having charge of parishes in New York he was appointed "defender of the marriage tie," being the first to fill this office, which in 1884 was instituted in the Catholic Church in the United States. Having become connected with the movement headed by Rev. Dr. McGlynn, he was retired from his parish to one of less prominence in 1890. In 1904 he was elevated to the dignity of domestic prelate by Pope Pius X, and in 1905 was made rector of Saint Mary's Church, Kingston, N. Y.

BURU, one of the Dutch East India islands, in the Indian Archipelago, west of and belongs to the residency of Amboyna. It is oval in shape, 92 miles long and 70 broad, and an area of 3,400 square miles. It has several bays, of which Cajeli is the largest, and contains a safe harbor sheltered from the monsoons. Viewed from this bay the island has a very fine appearance. In the foreground the minarets and native houses are seen through the openings of the rich tropical vegetation; while lofty mountains, wooded to their summits, shut in the view. The island is watered by 125 streams, large and small. On the northwest side there are vast swamps swarming with crocodiles. The island contains some high mountains — Mount Tumahu having an altitude of 8,530 feet. Buru produces a variety of valuable woods, balsams, resins and odoriferous flowers. The chief article of export is cajeput oil, of which about $50,000 worth is exported yearly; most being sent to Java. The tree from which it is obtained (*Melaleuca cajeputi*) grows also upon the islands of Amboyna, Ceram, Celebes and Sumatra; but the best oil is procured in Buru. The population (about 15,000) consists of Chinese in the interior, and Malays on the coast.

BURWASH, Nathaniel, Canadian educator: b. Argenteuil, near Saint Andrews, Quebec, 25 July 1839, of a loyalist family, who left Vermont during the American Revolution. He was educated at Victoria College, Cobourg, and Yale University, and entered the Methodist ministry in 1860. He was professor in Victoria College, 1867–73; dean of faculty of theology in 1873, and has been president and chancellor of Victoria University, Toronto, from 1887. He was secretary of education for the Methodist Church in Canada, 1874–86, and devoted much time toward bringing about university federation in the province of Ontario. He has published ‘Wesley's Doctrinal Standards’ (1881); ‘Handbook on the Epistle to the Romans’ (1887); ‘Inductive Studies in Theology’ (1896); ‘Manual of Christian Theology’ (1900); ‘Edgerton Ryerson’ (1902).

BURY, Sir George, Canadian railway official: b. Montreal, 6 March 1866. He was educated at Montreal College, entered the Canadian Pacific Railway service in 1883 as clerk in the purchasing department, rose to be general superintendent of the Central Division, Winnipeg, and in 1911 was appointed vice-president of the company and manager of their western lines. He was knighted in 1917.

BURY, John B., Irish scholar: b. 16 Oct. 1861. He was graduated from Trinity College, Dublin, in 1893 became professor of modern history in Dublin University, professor of Greek there in 1898, and Regius professor of modern history at Cambridge University since 1902. He has written ‘History of Greece to Death of Alexander the Great’ (1902); and has edited Pindar's ‘Isthmian Odes’; and ‘Nemean Odes’; Freeman's ‘History of Federal Government in Greece and Italy’; and Gibbon's ‘Decline and Fall’; ‘Life of Saint Patrick’ (1905); ‘The Ancient Greek Historians’ (Harvard Lectures 1908); ‘Constitution of the Later Roman Empire’ (1909); ‘History of the Eastern Roman Empire’ (1912); ‘History of Freedom of Thought’ (1913); and Freeman's ‘Historical Geography of Europe’ (1913).

BURY, Richard de. See AUNGERVILLE, RICHARD; PHILOBIBLON.

BURY, England, a municipal and parliamentary borough, in Lancashire, 10 miles north-northwest of Manchester. It is well situated on rising ground between the Irwell and the Roche, and, being much improved in recent times, now presents the appearance of a clean and well-built town. It has a handsome town hall and athenæum, a technical school and art gallery, Trevelyan Club, and Philips Hall, etc. Among the churches, Saint Mary's (the parish church) and Saint Thomas' are perhaps the finest, being highly ornate Gothic buildings with tower and spire. Bury was at one time the seat of a woolen industry introduced by the Flemings in the 14th century. The staple manufacture is that of cotton, and it was here that John Kay invented the fly-shuttle. There are also large woolen factories, bleaching and printing works, dyeworks, foundries, etc. The borough owns and operates the water supply, gas and electric undertakings. Sir Robert Peel was born at Chamber Hall in the vicinity in 1788; and a bronze statue of him adorns the town. Bury returns one member to Parliament. Pop. 59,040.

BURY SAINT EDMUNDS, England, parliamentary and municipal borough in West Suffolk, situated on the Lark, 26 miles northwest of Ipswich. It contains two fine churches, those of Saint James and Saint Mary. Among other buildings a shire-hall, a guild-hall, a corn exchange, athenæum with library, etc. Agricultural implements are manufactured, and there is a large trade in agricultural produce. Of many benevolent institutions the principal is a free grammar school founded by Edward VI. Bury Saint Edmunds sends one member to Parliament. It is an ancient place, and derived its name from Saint Edmund, a king of the East Angles, who was buried here. The barons in John's reign met here and swore to obtain the ratification of Magna Charta. Bury Saint Edmunds contains the remains of an abbey, once the most wealthy and magnificent in Great Britain, of which all that remains is the noble Norman tower or Church Gate, one of the best specimens of early Norman architecture in England, and the western gate, decorated in style. Pop. 16,785.

BURYING-BEETLES, coleopterous insects of the family *Silphidæ*. The carrion or sexton beetles are useful in burying decaying bodies of birds, mice, etc., in which they lay their eggs. The larvæ are crustaceous, flattened, with the sides of the body often serrated, black and of a fetid odor. They undergo their transformations in an oval earthen cocoon. In *Necrophorus* the antennæ have 10 apparent joints, and the rounded club is four-jointed. The genus *Silpha*, of which *S. lapponica* is a common species, differs in the third joint of the antenna being no longer than the second but shorter than the first. In *Necrophilus* the third joint is as long as the first. *N. surinamensis* has a yellow thorax with a central irregular black spot. *Catops* and its allies live in fungi, carrion and ants' nests, and are small, black, oval insects. There are between 800 and 900 species of the family, many of which are small and live in caves (see CAVE-DWELLING ANIMALS) or in nests of ants.

BURYING-PLACES, localities of sepulture of the dead. The custom of burying the dead in public places prevailed among the most ancient nations, including the Romans, who afterward, in the flourishing periods of the republic, burned their dead and kept the ashes in tombs, collected in urns. The ancient Germans buried their dead in groves consecrated by their priests. With the introduction of the Christian religion consecrated places were appropriated for the purpose of general burial; and it was regarded as ignominious not to be buried in consecrated earth. The deprivation of the rites of burial was therefore part of the punishment of excommunication. The Romans provided their gravestones, upon which were inscribed the name of the deceased, and the wish, *Sit illi terra levis* («May the earth rest lightly upon him»). This custom was preserved by the Christians. The Egyptians, Greeks and Romans erected over the graves of men of rank, or persons otherwise remarkable, pyramids, mausoleums or temples. After the introduction of Christianity little churches, called chapels, were erected over the dead. Early Christian martyrs were often buried in caverns, which by degrees were enlarged to spacious subterranean vaults. Subsequently others considered themselves happy if their bones were allowed to repose near the ashes of a martyr. As early as the 4th century the Christians built churches over the sepulchres of the holy martyrs; and in the belief that a place was sanctified by their ashes they anxiously sought out, on the erection of new churches in cities, or the transformation of heathen temples into Christian churches, the remains (relics) of the martyrs, and buried them under the altar of the new church to communicate to it a character of greater sanctity. The Emperor Constantine, who died in 337, is supposed to have been the first person who ordered his tomb to be erected in a church. This was done in the Church of the Apostles at Constantinople, of which he was the founder, and therefore probably considered himself as peculiarly entitled to this privilege. He was soon imitated by the bishops, and later all those who had enriched the Church were distinguished by this honor. The Emperors Theodosius and Justinian, indeed, forbade the erection of sepulchres in churches, but in vain. Leo the Philosopher again permitted them to everybody. At present interment in churches is almost everywhere suppressed, or at least permitted only under certain restrictions. Even in Naples and Rome the general practice of erecting sepulchres in churches was forbidden in 1809, and the foundation of burial places without the city was provided for. The custom introduced by the communities of Moravian Brothers, who form their burial places into gardens, is now becoming general; and cemeteries, instead of exhibiting merely dull ranges of tombstones, are adorned with flower plots and ornamental shrubbery. The celebrated burying-place of Père la Chaise, near Paris, is one of the most beautiful and interesting spots in the world. See also BURIAL; CREMATION; CATACOMBS.

BUSACO, boo-sä'kō, a hamlet in the province of Beira, on the north side of the river Mondego. It is memorable for the battle, 27 Sept. 1810, between Wellington and Masséna. Wellington, with about 40,000 men on a retreat before Masséna, with a force of 65,000, availed himself of the favorable position of the sierra or ridge here for checking the pursuit.

BUSBECQ, or BUSBEQUIUS, Ogier Ghislain de, Flemish diplomatist and author; b. Comines 1522; d. 1592. After having studied in the most celebrated universities of Flanders, France and Italy, he entered the service of Ferdinand, King of the Romans, who in 1555 sent him as Ambassador to Constantinople. In 1562 he returned home, after spending several years as tutor and guardian to the sons of Maximilian II, was sent to accompany the Archduchess Elizabeth (who was to be married to Charles IX) on her journey to France. Busbecq lived there as steward to Elizabeth, and when she left France, after the death of her husband, he remained as Ambassador of Rudolph II. Two important works of his survive, ‹Legationis Turcicæ Epistolæ Quatuor,› in which the policy, the power and the weakness of the Porte are so profoundly and clearly explained that even at present information may be drawn from them; and ‘Epistolæ ad Rudolphum II,’ a very important work for the history of those times. His style is pure, elegant and simple. During his stay in Turkey he collected Greek inscriptions and manuscripts. Consult Forster and Daniell, ‘The Life and Letters of Ogier Ghiselin de Busbecq’ (London 1881), which contains his most important writings: De Thou, ‘Histoire de mon temps’ (Paris 1604); St.-Genois, ‘Les voyageurs belges’ (Brussels 1847); Dupuis, (Etude sur l'ambassade d'Augier de Busbecques en Turquie’ (in ‘Memoires de la Societé des Sciences de Lille’).

BUSBY, Richard, English schoolmaster: b. Lutton or Sutton, Lincolnshire, 22 Sept. 1606; d. 6 April 1695. He was educated at Westminster School and at Oxford, where he entered Christ Church in 1624 and was graduated B.A. four years later, and received his M.A. in 1631. He became a tutor of his college and at the age of 33 was appointed prebendary and rector of Cudworth, in Somersetshire. In 1638 he was provisionally appointed headmaster of Westminster School and two years later was confirmed in this appointment, which he held continuously till his death. He was strict in discipline and a successful teacher, and among his pupils were many of the greatest men of his time — Dryden, Locke, Atterbury, South, Henry, Hooper and others. His published works were mainly school books, now long out of date. He was buried in Westminster Abbey.

BUSBY, a military headdress worn by hussars, artillerymen and engineers, consisting of a fur hat, with a bag of the same color as the facings of the regiment hanging from the top over the right side. The style and material of the busby vary in the different branches of the military service. The bag appears to be a relic of a Hungarian headdress, from which a long padded bag hung over and was attached to the right shoulder as a defense against sword cuts. It is worn only in times of peace.

BUSCH, Moritz, German publicist: b. Dresden, 13 Feb. 1821; d. 1899. He was educated at Leipzig and in 1847 began his literary work by translating a number of the novels of Dickens and Thackeray. As a member of the Radical party he was disappointed by the failure of the revolutionary movement of 1848 and came to the United States in 1851, but returned to Germany in 1852. He also traveled in the Orient in behalf of the Austrian Lloyds. In 1856 he became editor of the *Grenzboten*, and in this paper defended the policy of Bismarck. In April 1870 he was appointed to a position in the Foreign Office and accompanied Bismarck to France at the time of the Franco-Prussian War as reporter for the press. In 1873 he gave up his official position to become the editor of the *Hannoverschen Kuriers*, but continued to be a confidant of Bismarck and strongly advocated the Chancellor's policy in his articles for the press. After his visit to the United States he wrote ‘Wanderungen zwischen Hudson und Mississippi’ (1853), and ‘Die Mormonen’ (1857). Other works of his are ‘American Humorists’ (translations of selections from Mark Twain, Bret Harte, etc.); ‘The History of the International’; ‘The Humor of the German People’; ‘Count Bismarck and His People During the War with France’; ‘Our Chancellor’ (a life of Bismarck), and ‘Bismarck; Some Secret Pages of His History’ (translated into English 1898).

BÜSCHING, Anton Friedrich, German geographer: b. Stadthagen, Schaumburg-Lippe, 27 Sept. 1724; d. Berlin, 28 May 1793. He studied theology in Halle from 1744 and was for a time minister of a Protestant church in Saint Petersburg. When acting as a traveling tutor he became convinced of the defects of existing geographical treatises and resolved to write a new one, which he began on his return to Germany in 1752 by publishing a short description of Schleswig and Holstein as a specimen. In 1754 he was made professor of philosophy in Göttingen. In 1766 he was made director of the united gymnasiums of Berlin and the suburb Kölln. Before his great ‘Erdbeschreibung,’ which he began to publish in 1754 in separate volumes, and which, though not entirely completed by the author, passed through eight editions during his life, neither the Germans nor any other nation had a thoroughly scientific geographical work. Another of his important writings is the ‘Magazin für Historiographie und Geographie’ (25 vols., 1767–83).

BUSENBAUM, Hermann, German Jesuit: b. Notteln 1600; d. Münster, 31 Jan. 1668. He taught moral philosophy at Cologne and was rector of the Jesuit College at Münster. He is best known through his casuistical work, ‘Medulla Theologiæ Moralis, Facili ac Perspicua Methodo Resolvens Casus Conscientiæ,’ in which he treats of the principles of the Jesuit morals in a detailed and systematic manner. This book passed through 45 editions between 1645 and 1670, and has been reprinted in modern times. After Damiens' attempt to assassinate Louis XV of France, the charge was made that it had taught the Jesuits' approval of murder and regicide, it was therefore publicly condemned by the order and burned by the Parliament of Toulouse.

BUSH, Katharine Jeanette, American zoologist: b. Scranton, Pa., 30 Dec. 1855. She received her education in public and private schools at New Haven, Conn., studied zoology under the direction of Verrill at Yale University and in 1879 was appointed assistant of the Yale Zoological Museum. She became a member of the United States Fish Commission, also of the American Society of Naturalists and the American Society of Zoologists. She was joint editor of ‘Webster's Dictionary’ (1890 ed.), and is the author of ‘The Tubiculous Annelids of the Tribes Sabellides and Serpulides’ (in Harriman Alaska Expedition Series, Vol. XII, 1905); ‘Deep Water Mollusca’ (1885); ‘New Species of Turbonilla’ (1899), and contributions to the principal scientific journals.

BUSH, Hans, English lawyer: b. 1815; d. 1882. He received his education at King's College, London, and at the University of Cambridge. He was called to the bar in 1841. He attracted public notice through his advocacy of the establishment of rifle clubs as a means of defense of the nation. While still at the university, he published ‘The Rifle and How to Use It’ and instituted a rifle club among the undergraduates. In 1853 he reorganized the Victoria Rifles, then England's only volunteer body, and lectured and wrote in furtherance of his great hobby. To him belongs the honor of first suggesting life-saving stations and of organizing a model station. His principal work is 'The Navies of the World: Their Present State and Future Capabilities' (1859).

BUSH-BROWN, Henry Kirke, American sculptor: b. Ogdensburg, N. Y., 21 April 1857. He studied art in Paris and Italy and has a studio in New York. His most important works are equestrian statues of Generals Meade and Reynolds and the Lincoln Memorial at Gettysburg; the statue of Justinian, Appellate Court, New York; 'Indian Buffalo Hunt,' Chicago World's Fair; statues for Hall of Records, New York. He was elected a member of the National Sculptural Society and was prominent in the movement for municipal art.

BUSH CREEPERS, the English name of the *Uncotillinæ*, a subfamily of the *Sylviidæ*. These birds have sharp, conical bills and long, pointed wings. They are usually diminutive in size, active in habits, have a twittering note and build their nests in thickets, solitary bushes or trees. They are found in the warmer parts of both hemispheres, some of them, however, being migratory.

BUSH-DOG, a small wild dog (*Icticyon venaticus*), resembling a fox in appearance, found in Guiana and Brazil. It is distinguished by its one molar tooth in the upper jaw, has close hair and a short, stubby tail. Compare Fox-dog.

BUSH-HOG. See River-hog.

BUSH-QUAIL, the Anglo-Indian name for the button-quail (q.v.).

BUSHBUCK, any of several African antelopes, frequenting thickets and bushy regions. The name applies especially to the diminutive antelopes of the genus *Cephalolophus*, which the Dutch of South Africa called «duykers» (q.v.). These include the smallest members of their race, some of them standing only 13 inches high at the shoulders. They haunt the rocky hillsides, leaping with extraordinary agility from stone to stone and diving into the thickets at the first alarm. They feed upon berries, leaves, buds and similar food, rather than upon grass, and their flesh has a delicate flavor. The name «bushbuck» is also given, especially in South Africa, to the larger antelopes of the genus *Tragelaphus*, more distinctively known as «harnessed» antelopes, because their hides, often richly colored, are conspicuously marked with whitish stripes, suggesting a harness thrown over the back. The largest of these handsome antelopes is the West African bongo (*T. euryceros*), of the forests of the Gaboon region, which stands nearly four feet high and has horns 30 inches long. On the opposite side of the continent the nyala (*T. angasi*) frequents the fever-stricken swamps of the East African coast. Another well-known species of the swamps of southern and eastern Africa is Speke's antelope (*T. spekei*), native names for which are «nakong» and «sititunga.» It differs from its fellows in having a uniform grayish-brown silky coat, without any «harness,» but the young are faintly striped and spotted. This species is one of the best known of African antelopes wherever rivers or swamps occur, and still survives in considerable numbers. That species most often called «bushbuck» is the guib (*T. scriptus*), still to be found in the jungles along the African rivers from Abyssinia to the Cape. It is remarkable for its inferior size, which is about that of a goat, and for the variability of its markings, which has led to much confusion in describing it. The variety most common in Cape Colony is uniformly dark brown, with no stripes whatever, and only a few spots on the haunches. This genus of antelopes is closely allied to that of the koodoos (q.v.), and resembles them in that the females are hornless and usually differ in color from the males. Consult Lyddeker, 'Game Animals of Africa' (London 1908).

BUSHEL, a dry measure containing eight gallons or four pecks. The standard bushel in the United States (originally known as the Winchester bushel) contains 2150.42 cubic inches, and holds 77.627 pounds of pure water at a temperature of 39.8° F., and 30 inches atmospheric pressure. The English standard, the imperial bushel, has a capacity of 2218.20 cubic inches and holds 80 pounds of pure water at 62° F. See Weights and Measures.

BUSHIDO, boo-shē'dō («the way of the warrior»), the ethical code of the Samurai, the Japanese order of knighthood. It is in some ways like the code of the knights of the Middle Ages, demanding courage, honor and loyalty to country and rulers; it also enjoins the duty of suicide by hari-kari (q.v.) to avoid loss of honor. Although the formal code was given up when feudalism was abolished in Japan, its ideals still have great influence on the people, and many of the most prominent of the nation were educated according to its principles. It has given women a remarkable position in Japan and even yet instills in the young loftier ideals. See Samurai.

BUSHING, a piece of metal placed in machinery to reduce the wear of the major parts of the machine. It is also used to decrease the size of perforations and generally to reduce friction, eliminate rapid wear of moving parts and to prevent clogging. Bushings generally are inserted in the machine frame at those points where axles or other moving parts are to be inserted and are made of a harder material than the machine frame.

BUSHMAN, or BOSJESMANS, a dwarf African race inhabiting the Kalahari Desert and some of the more northerly portions of Cape Colony. Their average height seems to be rather less than five feet, but the Bushmen of the Cape are more stunted than those living farther north. The skin is of a dirty yellowish color, and they have repulsive countenances, with a somewhat prominent forehead, thick lips, large ears and small, deep-set, restless eyes. They are essentially a nomadic people, neither tilling the soil nor rearing domestic animals, but subsisting on the flesh of various wild animals, and on wild bulbs, roots, fruits, etc. They live in rocky caves or in rude nest-like structures in a bush. Consult Bleek, 'Reynard the Fox in South Africa' (London 1864); Stow, 'Native Races of South Africa' (New York 1905); Bleek and Lloyd, 'Specimens of Bushman Folklore' (London 1911).

BUSHMASTER, a large pit-viper (*Lachesis mutus*) of the rattlesnake family, numerous in northeastern South America, and called by the natives "surucucu." It is the largest and most venomous snake known, sometimes reaching a length of nine feet. Its ground color is pale yellow, darker on the back, and marked with a chain of jagged brown spots, and lighter on the belly. It has no rattle, but its tail terminates in a horny spur, which, when the tail is vibrated, strikes against the ground, producing a rattling noise, which can be heard several feet. It is similar to the rattlesnake in its habits, dwells wholly upon the ground, and its poisonous apparatus is greatly developed, making it a very deadly serpent, and one much feared. Consult Hopley, 'Snakes' (London 1882); Bates, 'A Naturalist on the River Amazon' (New York 1884); Moles and Urich, 'Serpents of Trinidad' in *Proceedings Zoological Society of London* (London 1894); Ditmars, 'Reptiles of the World' (New York 1910).

BUSHNELL, Horace, American theologian: b. Litchfield, Conn., 14 April 1802; d. Hartford, 17 Feb. 1876. He was graduated at Yale in 1827, engaged in journalistic and educational work, then studied law and theology at Yale, where for a time he was tutor, and in 1833 he began his brilliant pastorate of the North Congregational Church in Hartford, from which he retired owing to failing health in 1853. His writings on theological subjects were as remarkable for the interest and discussion which they aroused among religious scholars and thinkers as for their originality and independence of thought and vigor of utterance. Both as writer and preacher he was a commanding figure, and his influence was far-reaching. His works include 'Principles of National Greatness; Christian Nurture' (1847); 'God in Christ' (1849); 'Christian Theology' (1851); 'Sermons for the New Life' (1858); 'Nature and the Supernatural' (1858); 'Character of Jesus' (1861); 'The Vicarious Sacrifice' (1865); 'Women's Suffrage, the Reform Against Nature' (1869); 'Forgiveness and Law' (1874). He also contributed to several periodicals, and propounded many original views, even to the extent of being accused of heresy. However, he maintained his standing and commanded an ever increasing influence until his death. Consult Cheney, Mary B., 'Life and Letters of Horace Bushnell' (New York 1880); Munger, T. T., 'Horace Bushnell, Preacher and Theologian' (Boston 1899). The public services of Dr. Bushnell as a citizen were such as to make him long remembered for his civic pride and devotion to the interests of the city where his lifework was performed. Bushnell Park, Hartford, named in his honor, is a monument to his initiative and persistent efforts, whereby mainly the city came into possession of one of its chief adornments.

BUSHNELL, Ill., city in McDonough County, 60 miles west of Peoria, on the Chicago, Burlington and Quincy and the Toledo, Peoria and Western railroads. The city has manufactories of wood and steel tanks, pumps, wagons, buggies, brick and garden tools. Poultry farming is an important source of employment and great quantities are shipped annually and there is a good trade in farm implements. The waterworks are the property of the municipality. Pop. 2,619.

BUSHRANGERS, a name originally applied to desperadoes in Australia who took to the bush and supported themselves by levying contributions on property and persons. Not long after the establishment of penal settlements in Van Diemen's Land and Southern Australia by the British government the bushrangers began to make conditions disagreeable for the settlers in these colonies and their operations finally became so bold that martial law was proclaimed in Van Diemen's Land in 1815; and 15 years later a very stringent act was passed in New South Wales to do away with the nuisance. During the early days following the discovery of gold in Australia, these desperadoes obtained immense sums by robbing the diggers, stage coaches and metal convoys on their way from the mines to the cities and towns. In one haul a notorious gang headed by Capt. Frank Gardiner gathered in £7,490 in bank notes and more than 5,000 ounces of gold. Gardiner afterward came to the United States in 1874. "Jacky Jacky" in Tasmania headed several hundred escaped prisoners, establishing something very like a reign of terror in parts of the island. They finally made an attack on the governor's quarters on Norfolk Island. Hundreds of these malefactors were captured, tried and executed or imprisoned; while many more were killed by the government police, troops and armed citizens; but the country was not able to rid itself of them until roads were opened up and railways and telephones came, bringing with them rapid and sure communication. Consult Boxall, 'History of the Australian Bushrangers' (London 1908).

BUSHTIT, a very small titmouse of the genus *Psaltriparus*, two species of which inhabit the western United States. One, the least bushtit (*P. minimus*), is found in summer from the Rocky Mountains to the Pacific coast, and is noted for its nest, which is formed of moss, down, lint of plants and similar materials, and is shaped like an old-fashioned purse, 8 or 10 inches in length, suspended from the branch of a bush, and entered by a small hole near the top. The lining is of feathers and downy materials, and the eggs are 8 to 10 in number, and pure white. A southern variety of this is the lead-colored bushtit. A Mexican species (*P. melanotis*) is distinguished by black patches on each side of the head. The resemblance in the nesting habits of these birds to those of the European titmouse will be noted. See Titmouse.

BUSHWHACKER, a term applied during the Civil War to men living in the States where military operations were carried on, who professed to be neutrals and to be solely occupied in their ordinary vocations, but who seized opportunities to harass or attack individual soldiers or small bodies off their guard.

BUSINESS COLLEGES. See Education, Commercial.

BUSINESS LIFE INSURANCE. See Commercial Life Insurance.

BUSINESS MANAGER, Municipal. See City Manager.

BUSINESS SCHOOLS. See Education, Commercial.

BUSIRIS, boo-sī'-rĭs, in Egyptian mythology, a being of whom the most contradictory accounts are given by ancient writers, some speaking of him as a king, others affirming that the name meant simply the tomb of Osiris.

BUSKIN (Latin *cothurnus*), a kind of high-soled shoe or half-boot, worn upon the stage by the ancient actors of tragedy, in order to give them a more heroic appearance. The Greek word *kothornos* denoted a sort of closed boot, fitting either foot, worn by women; the tragic boot being the *embates* or *embas*. The word is figuratively employed by the Latin authors for tragedy itself, or for a lofty and elevated style. Consult Smith, K. K., 'The Use of the High-Soled Shoe or Buskin in Greek Tragedy of the Fifth and Fourth Centuries B.C.' in *Harvard Studies in Classical Philology* (Vol. XVI, 1905).

BUSONI, Ferruccio Benvenuto, Italian composer: b. Empoli, Florence, 1 April 1866. His parents, both of whom were skilled musicians, superintended his early musical training. He went to Leipzig in 1886 and in 1888 was appointed teacher at the Conservatory of Helsingfors. He was professor at the New England Conservatory, Boston, in 1891–93 and in 1894 settled in Berlin, where he has continued to reside. He made several very successful concert tours of Europe and also in the United States in 1910–11. He is an excellent performer on the piano. He was made chevalier of the Legion of Honor by France in 1913, the third of his race thus honored. His compositions include a concertstück for piano and orchestra, concerto for violin; 'Pojohlas' Daughter,' a symphonic poem; two suites for orchestra; 'Lustspiel Ouverture'; two string quartets, and the opera, 'Die Brautwahl' (1912).

BUSSA, boos'sä, or **BUSSANG**, British Northern Nigeria, central Africa, capital of Borgu, a wall-encircled town on the Niger at the rapids marking the head of river navigation from the sea. Here, attacked by the natives, Mungo Park, the explorer, was drowned in 1806. Pop. 12,000.

BUSSEY, Benjamin, American merchant: b. Canton, Mass., 1 March 1757; d. Roxbury, 13 Jan. 1842. He was a soldier in the Revolutionary War, became a silversmith in Dedham, afterward a merchant in Boston, where he acquired a large property, from which he bequeathed about $350,000 to Harvard College, one-half for founding the Bussey Institute, a school of agriculture and horticulture, and one-half for the support of the law and divinity schools of the college.

BUSSI, bü'sĭ, **D'AMBOISE, Louis de Clermont D'Amboise** (SIEUR DE): b. 1549; d. 19 Aug. 1579. He acquired an infamous notoriety by the prominent part he took in the massacre of Saint Bartholomew. He afterward attached himself to the Duke of Anjou, and obtaining the command of the castle of Anjou, made himself universally odious by his pride and oppression. He had the meanness to pander to the low passions of the Duke, and undertook to seduce the wife of the Count of Montsoreau. The intrigue cost him his life. Montsoreau, having come to the knowledge of it, obliged his wife to write Bussi, giving him a rendezvous at the castle of Constancières. Bussi arrived with a single confidant, and was immediately met by Montsoreau, who killed him.

BUSSON, bü-sôṅ, **Charles**, French painter: b. Montoire, Loir-et-Cher, 15 July 1822; d. 1909. He studied under Rémond and François and devoted himself to landscape painting. His style was not marked by the characteristics of the "open air school," but recalled the canvases of earlier masters in his chosen branch of art. Among his paintings are 'Les Ruines du château de Lavardin' and 'La chasse au marais.'

BUSSU PALM, a plant (*Manicaria saccifera*), common in the swamps of northern Brazil. Though it rarely exceeds 15 feet in height, it has huge leaves, said to be the largest undivided leaves produced by any palm, even reaching 30 feet in length by 4 or 5 feet in width. After splitting the midrib from end to end the leaves are laid obliquely upon rafters to form thatch for houses. This position makes the spaces between the veins act as gutters to carry off water. The spathes are used by the Indians for caps and bags and for cloth-making. The large, hard, three-seeded, olive-green fruits do not seem to be used commercially.

BUSSY-RABUTIN, bü-sē-rạ-bü-tăṅ, or **ROGER DE RABUTIN**, COMTE DE BUSSY: b. Epiry, Nivernois, 1618; d. Autun 1693. He entered the army at the age of 13, and made several campaigns. Turenne, in a letter to the King, describes him as the best officer in his army, as far as songs were concerned. His scandalous chronicle, entitled 'Histoire Amoureuse des Gaules,' cost him the loss of his official appointment and a year's imprisonment in the Bastile. He was a correspondent of Madame de Sévigné, and is often mentioned in her letters. He had the vanity to suppose that he excelled her in her peculiar art, and his letters were afterward published in seven volumes.

BUST (French *buste*, Italian *busto*, of uncertain origin), in sculpture, the representation of that portion of the human figure which comprises the head and the upper part of the body. The bust did not become common among the Greeks until the time of Alexander, nor among the Romans till the time of the empire. Among the Greeks, the portrait busts of the learned formed an important branch of art. The artists in these works exhibited a singular power of expressing character, and in this way we possess what are probably faithful likenesses of Socrates, Plato and other distinguished persons. The first Roman bust that can be depended upon as giving a correct likeness is that of Scipio Africanus the elder. The number of busts of the time of the Roman empire is very considerable, but those of the Roman poets and men of letters have not been preserved in so large numbers as those of the Greeks. A collection of drawings of antique busts was made by Fulvius Ursinus, and published with the title, 'Virum Illustrium Imagines' (Rome 1569; Antwerp 1606); subsequently a similar collection was published in the 'Iconographie Grecque' of Visconti (Paris 1811), which was followed by his 'Iconographie Romaine' in 1817.

BUSTAMANTE, boo-sta-män'tā, **Anastasio,** Mexican statesman and revolutionist: b. Tiquilpan, Michoacan, 27 July 1780; d. San Miguel Allende, 6 Feb. 1853. In 1808 he joined the Spanish army, and for a time fought against the party of the revolutionists, but in 1821 he acted with Iturbide. He was made Vice-President and commander of the army, in the administration of Guerrero, 1829. He afterward revolted and led the Centralist party, and in 1830 became acting President of Mexico. In 1832 Santa Anna opposed him at the head of an army, and he was conquered and banished 1833. When the Centralist party returned to power he was recalled, and in 1837 was elected President of Mexico. In 1842 he was obliged to retire from the Presidency, and was succeeded by Santa Anna. He served in the Mexican army in the war with the United States, retiring from military service in 1848.

BUSTAMANTE, Carlos Maria, Mexican historian: b. Oaxaca, 4 Nov. 1774; d. 21 Sept. 1848. He studied law and in 1801 began its practice. In 1805 he became editor of the *Diario de Méjico.* He held a command under Morelos in 1812, and was captured at Vera Cruz. He was released, and became a member of Congress and held other public offices. He founded a weekly newspaper, *La Avispa de Chilpancingo,* whose articles twice led to his imprisonment. His works treat of various periods of Mexican history, and are of special value, as he was an eye-witness of much that he describes. He published a history of the Mexican revolution (1823–32), and histories of the times of Iturbide and of Santa Anna.

BUSTARD QUAIL, the name given by Anglo-Indians to the button-quail (q.v.).

BUSTARDS, a family of game birds (*Otididæ*) of the Old World, which, however, are not gallinaceous, but are related in structure on the one hand to the cranes, and on the other to the plovers. They are inland birds, haunting dry, grassy and sandy plains, and in the more settled districts resorting to stubble-fields and pasture-land. They have strong legs and feet, as well as good wing-power, and spend more of their time on the ground than in flight. Most of them are birds of handsome plumage, the upper parts being mottled with brown and reddish tints, set off with white and black. Ornamental plumages are characteristic of the group, and often form crests, or ruffs, about the head, neck and breast. Bustards are known in the Mediterranean regions, and throughout southern Asia to China and Japan. They also abound all over Africa, and one species (*Eupodotis australis*) inhabits Australia, where it is called «native turkey.» Those of North Africa and western Asia are known as «houbaras,» and form the favorite game-birds of that semi-desert region. Certain small species of India, favorites with sportsmen, are called «floricans.» The typical, and best-known bustard, however, is *Otis tarda,* now extinct in Great Britain, but numerous throughout the Mediterranean countries. It has somewhat the size and form of an American turkey, and is the largest and one of the most valuable of European game-birds. A remarkable feature of this species is the fact that a great pouch, opening under the tongue, is developed in the throat of the male of some examples during the breeding season. This phenomenon is restricted to adult birds, and the pouch disappears at other times of the year. Its utility is unknown. A much smaller but otherwise similar species, the little bustard (*Otis tetrax*), is another favorite with European sportsmen. The term is sometimes erroneously applied to other large birds, such as the Magellanic goose of Argentina. Consult Aflalo, 'Sport in Europe' (London 1901); Seebohm, 'Birds of Asia' (London 1901); Bryden, 'Nature and Sport in South Africa' (London 1897).

BUSTO-ARSIZIO, är-sits'ĭo, Italy, city in the northern division, 21 miles northwest of Milan. It contains a church, designed by Bramante, and containing frescoes by Gaudenzio Ferrari. It has manufactures of cotton goods and a trade in wine. Pop. 25,992.

BUSYBODY, The, a pen name under which Benjamin Franklin wrote a series of papers, modeled on 'The Spectator' of Addison; also a comedy by Mrs. Centlivre, 1709.

BUTADES. See Dibutades.

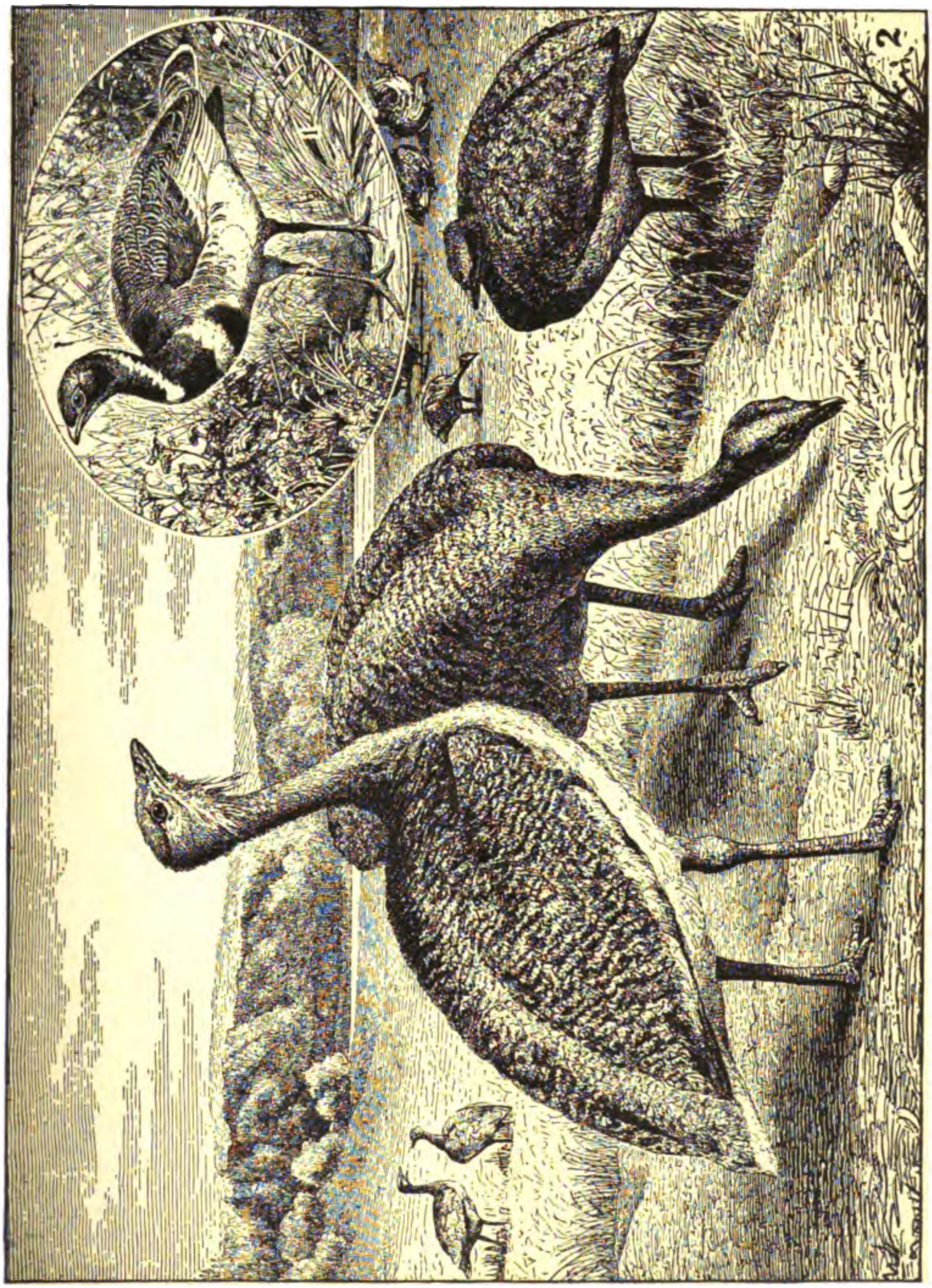
BUTANE and **ISOBUTANE,** two gaseous compounds of carbon and hydrogen with the same molecular formula, C_4H_{10}, yet differing in their chemical properties. They are similar to marsh gas. Crude petroleum contains dissolved butane.

BUTCHER. See Abattoir.

BUTCHER, Samuel Henry, Irish classical scholar: b. Dublin, 16 April 1850; d. 29 Dec. 1910. He was educated at Marlborough College, and Trinity College, Cambridge, and was a lecturer at University College, Oxford, 1876–82. From 1882–1903 he was professor of Greek in the University of Edinburgh, and in 1906 he was elected one of the members for Cambridge University. In 1904 he visited the United States to deliver a series of lectures at Harvard University and other places. He has published a 'Prose Translation of the Odyssey' (with A. Lang q.v.) (1879); 'Demosthenes' (1881); 'Some Aspects of the Greek Genius' (1891); 'Aristotle's Theory of Poetry and the Fine Arts, with a Critical Text and Translation of the Poetics' (1895); 'Demosthenes' Orationes' (1903, 1907); 'Harvard Lectures on Greek Subjects' (1904).

BUTCHER-BIRD, a shrike of the family *Laniidæ,* representatives of which range throughout the northern hemisphere. They are birds of moderate size, and gray and white in color, with black markings upon the head, wings and tail, which are properly included among the insect-eating birds, but have developed certain falcon-like traits. They are of powerful build, with hooked beaks, and strong claws, and in winter, when insect prey is not easily obtained, they are accustomed to strike down small birds, and to seize mice, shrews, etc. These they carry off in their claws to some thorn-tree, or to a fence with spikes, and impale them one by one upon the thorns, or other sharp points, in order to fix them firmly while they feed upon their flesh. It often happens, however, that their love of the chase exceeds their appetite, so that they will catch and store away several victims, whose frozen bodies remain hanging upon the thorns, like meat in a butcher's shop; the Germans have a popular belief that nine victims are thus stored at a

BUSTARDS



1 Little Bustard

2 Great Bustard

time, and call the birds "nine-killers." These shrikes make rude nests in trees and lay four or five brownish spotted eggs. They feed their young upon insects, and these form the larger part of their own fare, especialy grasshoppers. A typical species, common over northernmost North America, is the great northern shrike (*Lanius borealis*), which is rarely seen in the United States, except in winter. Another species, the loggerhead (*L. ludovicianus*), dwells in the Southern States and is somewhat smaller in size. Consult Ingersoll, ‘Wild Life of Orchard and Field’ (1902); Newton, Alfred, ‘Dictionary of Birds’ (New York 1896); Evans, A. H., ‘Birds’ in ‘Cambridge Natural History’ (Vol. IX, ibid., 1900). See Shrike.

BUTE, bŭt, **John Patrick Crichton-Stuart**, (3d Marquis of): b. Mountstuart, 12 Sept. 1847; d. 9 Oct. 1900. He was educated at Harrow and Oxford. He was mayor of Cardiff in 1891–92, and did much to advance the commercial prosperity of that city. From 1892 to 1898 he was lord rector of Saint Andrew's University, which benefited greatly by his munificence. He donated Bute Hall to Glasgow University. He was deeply interested in Scottish history, and was the author of ‘Early Days of Sir William Wallace’; ‘The Burning of the Barns of Ayr’; and ‘Altus of Saint Columba.’ His secession from the Scottish Presbyterian to the Roman Catholic Church in 1868 caused a sensation in Scotland. He figures as the hero in Disraeli's novel, ‘Lothair.’ He was the author of an adequate and scholarly translation of the Roman ‘Breviary.’

BUTE, John Stuart (3d Earl of), British statesman: b. Edinburgh, 25 May 1713; d. 10 March 1792. His grandfather was created a peer in 1703, and the family was connected with the royal Stuart line. In 1737 he entered Parliament as one of the Scottish representative peers, but was not re-elected in 1741. He then retired to his estates, and lived there wholly secluded till the landing of the Pretender in Scotland in 1745 induced him to go to London and offer his services to the government. He soon gained influence with the Prince of Wales, and succeeded in making himself indispensable to him. At his death, in 1751, he was appointed by the widowed Princess chamberlain to her son, and was intrusted by her with his education. Bute never lost sight of his pupil, and possessed so much more influence with the Princess of Wales than her son's particular tutors, the Earl of Harcourt and the bishop of Norwich, that they resigned their offices. George II died 25 Oct. 1760, and two days after Bute was appointed member of the privy council. In March 1761 the Parliament was dissolved and Bute was made Secretary of State. Pitt, who saw his influence in the new council annihilated, resigned the same year. This event made an unfavorable impression on the nation; but Bute, possessing the unbounded confidence of his King, stood at the head of the state. After a severe contest in Parliament, he concluded a peace with France. The terms for England were perhaps not disproportionate to the successes obtained during the war; but Bute was obliged to bear the most bitter reproaches. He, however, succeeded in winning the popular favor, and everything seemed to promise the power of the minister a long continuance. The influence of Bute seemed unbounded, when it was made known, contrary to expectation, that he had resigned his office as Prime Minister, and intended to retire into private life. In 1766 Bute declared in the House of Lords that he had wholly withdrawn from public business and no longer saw the King; still it was not doubted that his great influence continued. It was only on the death of the Princess of Wales, 1772, that he seems first to have given up all participation in the affairs of government. He spent his last years on his estate. A costly botanical garden, a library of 30,000 volumes, excellent astronomical, philosophical and mathemathical instruments, afforded him occupation. His favorite study was botany, with which he was intimately acquainted. For the Queen of England he wrote the ‘Botanical Register,’ which contained all the different kinds of plants in Great Britain (9 vols. 4to). This work is remarkable, both for its splendor, in which it excels all former botanical works, and for its rarity. Only 12 copies were printed, at an expense of more than $50,000. Consult A. von Ruville, ‘William Pitt and Gref Bute’ (Berlin 1895); Lovat-Fraser, ‘John Stuart, Earl of Bute’ (New York 1912).

BUTE, Scotland, an island in the estuary of the Clyde, with an area of 30,000 acres, belonging principally to the Marquis of Bute. It is about 16 miles long, and the average breadth is 3¼ miles. Agriculture is in an advanced state, and there are about 20,000 acres under cultivation. The herring fishery is also a source of considerable profit. The only town is Rothesay, whose ancient castle is one of the many interesting antiquities of the island. Mount Stuart, the seat of the Marquis of Bute, is four miles south of Rothesay. The climate of Bute is milder than that of almost any part of Scotland. The county of Bute comprises the islands of Bute, Arran, Great Cumbræ, Holy Isle, Little Cumbræ, Inchmarnock and Pladda, with a total area of 139,658 acres, but only a small part is under cultivation. Arran is about double the size of Bute, but the other islands belonging to the county are small. The county returns one member to Parliament. Pop. of Bute, 11,835.

BUTEA, a small genus of trees or woody vines of the family *Fabaceæ*, natives of China and India, noted for their racemes of large, rich, usually scarlet, papilionaceous flowers, for which they are cultivated in warm countries and to a small extent in warm greenhouses. The best-known species (*B. frondosa*) is called the dhak or pulas tree in India, and is grown out of doors in California. It is a leafy tree, attains a height of 50 feet and bears very slowly orange-crimson flowers, which are used in the Orient under the name keesoo or teesoo for dyeing yellow or orange. Its fibrous roots and bark are used for caulking boats, making rope, etc. Its red, resinous gum, with which the twigs are frequently covered, is said to be very rich in tannin, and is found in the markets of India. The seeds are used as a vermifuge.

BUTESHIRE, Scotland, county in the West Midlands division. It includes Bute, Arran, Pladda, Marnoch, Cumbraes, Iona and several smaller islands; has a total area of 220 square miles and a population of 18,186. Agriculture and fishing are the only industries of any extent. Rothesay, Bute, is the county-seat.

BUTIN, bü-tăṅ, **Ulysse Louis Auguste**, French painter: b. Saint Quentin 1838; d. Paris, 9 Dec. 1883. He was a pupil of Picot and Pils. His subjects are mostly from the life of the French fishermen, and his work shows remarkable truthfulness to nature. Among his best paintings are ‘The Departure’; ‘Fishing’; and ‘Burial of a Sailor at Villerville.’

BUTLER, Alban, English writer on religious topics: b. 1711; d. Saint Omer 1773. He received his education at that famous centre of English Catholicism, the English College of Douai, was ordained to the priesthood and was successively professor of philosophy and theology at Douai. Later he traveled throughout Europe and was appointed chaplain to the Duke of Norfolk. He became afterward president of the College of Saint Omer. He spent 30 years in compiling his great life-work, ‘The Lives of the Saints.’ It appeared in four volumes (1756–59) and after his death in 12 volumes with annotations omitted from the former edition.

BUTLER, Amos William, American ornithologist, sociologist and philanthropist: b. Brookville, Ind., 1 Oct. 1860. He was educated at Hanover College and at Indiana University; was one of the founders of the Indiana Academy of Science, and became its president in 1895; became general secretary American Association for the Advancement of Science 1891; vice-president of the section of Anthropology, 1900; president of the National Conference of Charities and Corrections, 1906–07; president of the American Prison Association, 1909–10; chairman of the American Committee on International Prison Congress, 1909–10; vice-president of the International Prison Congress, 1910; secretary of the Indiana Board of State Charities since 1897. He has published ‘Birds of Indiana’ (1891) and many other papers on ornithology, anthropology and charities and correction, which have appeared in the publications of scientific societies.

BUTLER, Andrew Pickens, American politician: b. Edgefield District, S. C., 7 Nov. 1796; d. near Edgefield Court-house, 5 May 1857. He was admitted to the bar in 1819, and in 1824 was elected to the legislature as the representative of his native district. In 1831, a period marked by the apprehended collision of South Carolina with the Federal government, on the nullification issue, he was elected colonel of a regiment of cavalry. In 1833, still a member of the legislature, he was made a judge of the Courts of General Sessions and Common Pleas. Subsequently, when a change was made in the judiciary system, he was transferred to the supreme bench of the State, where he continued until 1846, when he was elected a senator in Congress. Soon after taking his seat in this body, he was appointed chairman of the Judiciary Committee. One of his earliest speeches was against making Colonel Benton lieutenant-general of the army. The Kansas question, the action of the naval retiring board, the abolition question and all others affecting the peculiar interests of South Carolina, and the general welfare of the South, engaged him in frequent debate, in which he always took a conspicuous part. His last speech was in reply to Mr. Sumner, and in defense of South Carolina.

BUTLER, Benjamin Franklin, American lawyer and soldier: b. Deerfield, N. H., 5 Nov. 1818; d. Washington, D. C., 11 Jan. 1893. He was graduated at Waterville College (now Colby University); studied law, was admitted to the bar in 1841, and beginning practice at Lowell, Mass., became distinguished as a criminal lawyer and politician. He was a member of the State legislature in 1853, of the State senate in 1859–60, and a delegate to the Democratic National Convention of 1860, which met at Charleston and adjourned to Baltimore. He supported the nomination of John C. Breckenridge, which rendered him so unpopular in the North that he was defeated for governor of Massachusetts in that year. Butler had risen to the rank of brigadier-general of militia; and at the outbreak of the Civil War, he marched with the 8th Massachusetts Regiment, and, after a check at Big Bethel, was appointed to the command of Baltimore and of eastern Virginia, with his headquarters at Fort Monroe. In February 1862 he commanded the military forces sent from Boston to Ship Island, near the mouth of the Mississippi; and, after New Orleans had surrendered to the naval forces under Farragut, he held military possession of the city. His administration was vigorous and while mostly just was severely criticized. Especial notoriety attached to his order directing that women who should publicly insult United States officers be regarded as women of the street. The order was bitterly resented in the South and caused Jefferson Davis to order that Butler be considered a felon and if captured, that he be hanged. Relieved of his command, he acted under General Grant in his operations against Petersburg and Richmond in 1864. Returning to Massachusetts at the end of the war, he took an active part in politics as an extreme radical, advocated the impeachment of President Johnson, and in 1866–75 was a member of Congress. In 1877 and 1879 he was defeated as candidate for governor of Massachusetts, but in 1882 was elected by a large majority. In 1884 he ran for the Presidency as the candidate of the Greenback and Anti-Monopolist parties, but was defeated, carrying no State. He published ‘The Autobiography and Personal Reminiscences of Maj.-Gen. Benjamin F. Butler’ (1892). Consult Parton, ‘Butler in New Orleans’ (New York 1863); Bland, ‘Life of Benjamin F. Butler’ (1879); ‘Private and Official Correspondence of General Benjamin F. Butler: During the Period of the Civil War’ (5 vols., 1918). Consult also Rhodes, James F., ‘History of the United States, from the Compromise of 1850’ (Vol. V, New York 1902).

BUTLER, Charles, English Roman Catholic historian: b. London, 15 Aug. 1750; d. there, 2 June 1832. He was nephew of the Rev. Alban Butler (q.v.). He was called to the bar in 1791, and was the first Roman Catholic who was admitted, after the passing of the relief bill of that year. He wrote ‘Horæ Biblicæ,’ giving a history of the original text, early versions and printed editions of the Old and New Testaments, and also of the ‘Koran,’ ‹Zend-Avesta› and the ‹Edda.› This first appeared in 1797, and was followed by ‹Horæ Juridicæ Subsecivæ,› a connected series of notes respecting the geography, chronology and literary history of the principal codes and original documents of the Grecian, Roman, feudal and canon law. He continued and completed Hargrave's ‹Coke Upon Littleton›; supervised the 6th edition of Fearne's ‹Essay on Contingent Remainders›; wrote a history of the geographical and political revolutions of Germany, and a ‹Historical and Literary Account of the Formularies, Confessions of Faith, or Symbolic Books of Roman Catholic, Greek and Principal Protestant Churches.› During the last 25 years of his career he principally devoted his pen to the vindication of the Roman Catholic Church. He published numerous biographies of eminent Roman Catholic divines and authors; continued his uncle's ‹Lives of the Saints,› and produced ‹Historical Memoirs of the English, Irish and Scottish Catholics.› When Southey's ultra-Protestant ‹Book of the Church› appeared, it was replied to in Butler's ‹Book of the Roman Catholic Church,› which gave rise to six answers on the Protestant side, two of which were responded to by Butler. His ‹Reminiscences› appeared 1822–27. As a constitutional lawyer his reputation was very high.

BUTLER, Ellis Parker, American humorist: b. Muscatine, Iowa, 5 Dec. 1869. His first great success ‹Pigs is Pigs› (1906), was followed by others equally successful. These include ‹The Incubator Baby› (1906); ‹Perkins of Portland› (1906); ‹Great American Pie Company› (1907); ‹Confessions of a Daddy› (1907); ‹Kilo› (1907); ‹That Pup› (1908); ‹Cheerful Smugglers (1908); ‹Mike Flannery› (1909); ‹Thin Santa Claus› (1909); ‹Water Goats› (1910); ‹Adventures of a Suburbanite› (1911); ‹The Jack-Knife Man› (1913); ‹Domine Dean, A Tale of the Mississippi› (1917). He is secretary and treasurer of the Authors' League of America.

BUTLER, Howard Crosby, American educator: b. Croton Falls, N. Y., 7 March 1872. He was educated at Princeton University, at the Columbia School of Architecture and at the American schools of Classical Studies in Rome and in Athens. In 1899, 1904 and 1909 he led three archæological expeditions in Syria. In 1905 he was appointed professor of the history of architecture at Princeton. His publications are ‹Scotland's Ruined Abbeys› (1900); ‹The Story of Athens› (1902); ‹Architecture,› Part II of ‹Publications of American Expedition to Syria› (1903); ‹Ancient Architecture in Syria,› in Division II of ‹Publications of Princeton Expedition to Syria›; also papers in archæological journals.

BUTLER, James (DUKE OF ORMONDE), English statesman: b. London, 19 Oct. 1610; d. Kingston Hall, Dorsetshire, 21 July 1688. When Strafford became lord-lieutenant of Ireland, Butler was made commander of the army, but as it consisted of only 3,000 men, and he was overruled by the lords justices, he could do little more than keep the enemy in check, and was obliged to agree to a cessation of hostilities; after which, having been created a marquis, he was appointed lord-lieutenant. On the ruin of the royal cause he retired to France. After the execution of Charles he returned to Ireland with a view to raising the people; but on the landing of Cromwell returned to France. While abroad he exerted himself to further the restoration of Charles; and when that event was brought about by Monk, returned with the King. Before the coronation he was created duke, and assisted at that ceremony as lord high-steward of England. In 1662 he was again appointed lord-lieutenant of Ireland, which country he restored to comparative tranquillity, and was an active benefactor of it by encouraging various improvements, particularly the growth of flax and manufacture of linen. On the exile of Lord Clarendon, his attachment to that nobleman involved Butler in much of the odium attached to him, and although, on his recall from Ireland, nothing, on the most rigorous inquiry, could be proved against him, he was removed through the machinations of Buckingham. For seven years he was deprived of court favor, but at length was again appointed lord-lieutenant of Ireland, which place he held until, shortly before the death of Charles, he was recalled in order to make way for Rochester. He died at his seat in Dorsetshire, leaving behind him the character of a man who united the courtier and the man of honor and integrity better than any nobleman of the time.

BUTLER, James Glentworth, American Presbyterian clergyman: b. Brooklyn, N. Y., 3 Aug. 1821; d. Boonton, N. J., 28 Dec. 1916. He was the son of one of the five founders of the First Presbyterian Church in Brooklyn. He was educated at Yale, the Union Theological Seminary and Yale Divinity School, and was ordained in the Presbyterian ministry in 1852. He served in Williamsburg and then at the Walnut Street Presbyterian Church in Philadelphia from 1852 to 1868. Next he became secretary, treasurer and editor of the American and foreign *Christian Union,* remaining in that field 11 years. He spent the following 20 years compiling a series of 11 volumes entitled ‹The Bible Work,› which constitute what some authorities regard as the most comprehensive and valuable commentary on the Bible that has ever been written. It had a wide circulation in many languages. Other works issued by Dr. Butler are ‹Topical Analysis of the Bible› (1896); ‹Vital Truths Respecting God and Man› (1904); and ‹Present Day Conservatism and Liberalism› (1911).

BUTLER, John, American royalist leader in the American Revolution: b. Connecticut; d. Niagara 1794. He became a leading resident of Tryon County, N. Y.; commanded the Indians in the Niagara campaign (1759) and in the Montreal expedition (1760). At the outbreak of the Revolution he sided with the Tories and became deputy superintendent of Indian affairs. In 1776 he organized a band of marauders, chiefly Indians, and fought the battle of Oriskany (1777); in July 1778, he commanded at the brutal Wyoming massacre. In 1780 he took part in Sir John Johnson's raid on the Mohawk settlements. At the end of the war he fled to Canada, and was appointed Indian agent.

BUTLER, Joseph, English philosopher and theologian: b. Wantage, Berkshire, England, 1692; d. 1752. Although reared a Presbyterian, he became a member of the Episcopal Church, and entered Oriel College, Oxford, in 1714. After receiving his degree he took orders and was appointed preacher at the Rolls Chapel, where he preached the famous "Sermons on Human Nature" which have given him a leading place among moral philosophers. These (of which the first three are of fundamental importance) were published in 1726. Ten years later (1736) appeared his famous 'Analogy of Religion, Natural and Revealed, to the Constitution and Course of Nature.' He gained the friendship of Queen Caroline who at her death left a request that he should receive promotion in the Church. In 1738 he was appointed bishop of Bristol, and in 1750 was promoted to the bishopric of Durham.

Butler's "Sermons on Human Nature" have given him a foremost place among ethical writers, and have had an important place in the instruction at the English universities. His ethical teachings are directed at what might be called the "naturalistic" view which was formulated with great clearness by Hobbes in the previous century and which still seemed sufficiently dangerous in the 18th century to require repeated refutation. The doctrines of Hobbes as against which the more "orthodox" writers directed their attacks were: (1) That moral distinctions are not "natural," founded in the nature of things, but conventional, resting upon the authority of a state founded by social contract; and (2) that human nature is essentially egoistic. These positions had been controverted by Cudworth, Samuel Clarke and others who sought to show that moral relations belong to the very nature of things. Butler chose a more concrete method of inquiry. There are two ways, he says, in which moral questions can be treated. "One begins from inquiring into the abstract nature of things, the other from a matter of fact, namely, what the particular nature of man is, its several parts, their economy or constitution; from whence it proceeds to determine what course of life it is which is correspondent to this whole nature." It was this psychological method which Butler adopted. Human nature, he maintains, is to be regarded as a whole or system, which is made up of parts, but which cannot rightly be understood until we consider "the relations and respects which these parts have to each other." In addition to particular affections and instincts, Butler finds that there is in man a natural instinct which makes for his own preservation and happiness, and also a natural principle of benevolence whose object is the good of others. These are the two general principles which he names self-love and benevolence. Against Hobbes, he argues that the latter is just as fundamental and natural as the former. The constitution of our nature proves therefore that we are made for society. But, on the other hand, Butler will not deny the legitimacy of self-love, or identify, as had been done, the content of morality with benevolence. The self-love which is approved, however, is not a particular affection, but a general principle of regard for one's own happiness and interests. It is "cool" or "rational" self-love which is justified. This principle may, however, become perverted into selfishness or egoism by being allowed to operate without due reference to the elements of human nature. It then loses its authority and ceases to be a general principle. Men constantly sacrifice their most evident interest to fancy, inquisitiveness, love, hatred or any vagrant inclination, and thus violate their nature no less in regard to their individual than to their social end. Self-love has accordingly a regulative control over the particular passions and inclinations: it possesses higher authority, and this authority is something quite distinct from the question as to which in any given case happens to be stronger. There are some passages in which it might seem that Butler intends to identify morality with what he calls "rational self-love," and to subordinate benevolence as a particular affection to it. Yet it is evident from the whole context of his ethical system that he rather intends to show that self-love and benevolence are co-ordinate, but not contradictory principles, both superior to what he calls the "particular affections," and both in turn harmonized and systematized in human nature by the supreme principle of conscience. "There is a natural principle of benevolence in man, which is in some degree to society what self-love is to the individual." By insisting as he does upon the presence in human nature of these two principles, and their necessary harmony, Butler avoids the extremes of making one or other of these principles supreme in conduct, as well as the necessity of denying or explaining away the other. He transcends the fundamental conflict between "interested" and "disinterested" conduct, in which his predecessors and many of those who came after him found themselves involved; and he goes far in suggesting the conception of the complementary character and essential unity of these principles in the idea of a "social self."

But Butler's ethical system receives its completion in the idea of conscience as the supreme authoritative principle to which both self-love and benevolence are subordinate. He defines conscience as that "principle of reflection in men by which they distinguish between, approve and disapprove their own actions." Moreover, "conscience not only offers itself to show us the way we should walk in; but it also carries its own authority with it, that it is our natural guide." The conclusion is that from the very make or constitution of man he is in the strictest sense a law unto himself. "Had conscience strength, as it has right; had it power, as it has manifest authority, it would absolutely govern the world." Two objections have been brought against Butler's view of conscience by modern writers. In the first place, it is urged that it involves a falling back upon mere intuition, upon a principle that can give no account of itself or of its mode of operation. There are doubtless some passages in his writings which, taken by themselves, might seem to justify this interpretation. But it is necessary to remember that for Butler conscience is reason or reflection, that is, that it is the action of the whole moral constitution of man, and that in following its requirements we are acting in the light of the whole. The second criticism is that for him conscience seems to pronounce infallible judgments, taking no account of circumstances, and not providing for the growth or development of ethical judgment. It is doubtless true that Butler was concerned to defend the "absolute" authority of conscience as a principle of human nature. Yet it is not for him any mechanically acting faculty: the due proportion between self-love and benevolence is different in different cases, and "can be judged only from our condition and nature in this world." Conscience itself develops with use and practice, becoming more and more adequate to deal with the changing conditions of life, and giving rise to virtuous habits and fixed modes of character. Morality for him is no set of fixed axiomatic truths, infallibly perceived once for all; but it is what the moral reason perceives in particular situations to be correspondent to man's nature and constitution when this is seen in its true perspective.

Butler's 'Analogy' is the most famous and most carefully reasoned defense of revealed religion which appeared in England during the 18th century. It was directed against deism (q.v.) and sought to meet the attacks which this school of writers brought against the traditional view of theology. Butler undertakes to show that the course of nature suggests not only the conclusions, which the deists admitted, of the existence of God and the duty of worshipping Hin; but also, when looked at more closely, natural occurrences and laws seem to furnish evidence for the doctrines of revealed religion which the deists discarded and denied as immoral. Butler's candor in pointing out what might be called imperfections and injustice in nature, which the deists were inclined to neglect, has led to the remark that his treatment tends to raise doubts rather than to settle them, and that his conclusions might be read by a sceptical mind in a different way. However this may be, one can say that Butler's 'Analogy' together with Hume's 'Dialogues on Natural Religion' served to undermine, long before the appearance of Kant's systematic criticism, the rationalistic conclusions of "natural religion." It should be noted that Butler did not profess to furnish a demonstration for the doctrines of revealed religion, but only to show their probability by pointing out their analogy with the course of nature. For man, as he says, in all such matters, "probability is the very guide of life."

Bibliography.— There are many editions of Butler's works; the most recent being that of Gladstone in two volumes, 2d ed., 1898. Mr. Gladstone also published a volume entitled 'Subsidiary Studies on Butler.' Consult also Collins, W. L., 'Butler' (Blackwood's 'Philos Classics'); Stephen, Leslie, 'English Thought in the 18th Century' (Vol. I); Sidgwick, H., 'History of Ethics'; Lefevre, A., articles in the *Philosophical Review*, Vols. VIII and IX.

JAMES E. CREIGHTON,
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BUTLER, Josephine Grey, English philanthropist: b. Milfield, Gloucestershire, about 1828; d. 30 Dec. 1906. Married George Butler, afterward Canon Winchester, 1852. She was prominent in efforts for the higher education of women, and for moral reform, and published 'Life of John Grey of Dilston'; 'Life of Catherine of Siena'; 'Recollections of George Butler'; 'The Lady of Shunem'; 'Personal Reminiscences of a Great Crusade'; 'Prophets and Prophetesses'; 'Nature Races and the War'; 'Silent Victories'; 'The Hour Before the Dawn'; 'Government by Police'; 'The Constitution Violated'; 'Women's Work and Women's Culture'; 'Life of Oberlin'; 'A Voice in the Wilderness.'

BUTLER, Marion, American legislator: b. Sampson County, N. C., 20 May 1863. In 1889 he was admitted to the bar and practised successively in Raleigh and Washington. He was elected to the senate of North Carolina in the late eighties and took a prominent part in railway regulation legislation. He abandoned the Democratic party in 1892, became one of the organizers of the Populist party and from 1896 to 1904 served as chairman of its executive committee. In 1896 he was elected United States senator, serving until 1902. He successfully piloted through the Senate a bill providing for rural free delivery in the postal service. He also advocated the establishment of postal savings banks. Being defeated for the Senate in 1902, he thereafter allied himself with the Republicans.

BUTLER, Matthew Calbraith, American army officer: b. near Greenville, S. C., 8 March 1836; d. 1900. He studied law at Stonelands, near Edgefield Court-house, and was admitted to the bar in December 1857. He was elected to the legislature of South Carolina in 1860; entered the Confederate service as captain of cavalry in the Hampton Legion in June 1861, and became a major-general through the regular grades; lost his right leg at the battle of Brandy Station on 9 June 1863. He was elected to the legislature of South Carolina in 1866; was United States senator in 1877–95; commissioned a major-general of volunteers for the war with Spain, 28 May 1898; and was appointed one of the American commissioners to arrange and supervise the evacuation of Cuba.

BUTLER, Nicholas Murray, American educator: b. Elizabeth, N. J., 2 April 1862. In 1882 he was graduated at Columbia University with the highest honors. In 1882–84 he served as fellow in philosophy and studied in Berlin and Paris for one year. In 1885 he became assistant professor of philosophy and in due time held the chair of philosophy, psychology and ethics. In 1890 on the reorganization of the university he became dean of the faculty of philosophy. He founded the New York College for Training Teachers, in 1887, which later became Teachers' College, and is now known as Hunter College, under Columbia University. In 1901 Dr. Butler succeeded Seth Low as president of Columbia. His administration has been most successful in extending the influence of the university in the educational field and in its relation to the life of the country at large. Dr. Butler has taken a deep interest in politics and in 1912 was the Republican party's candidate for Vice-President of the United States on the ticket with William H. Taft. He has done much for the cause of education, founding the *Educational Review* in 1891 and editing it for the intervening interval as well as 'The Great Educator Series,' 'The Teachers' Professional Library' and 'Columbia University Contributions to Education and Philosophy.' Dr. Butler has been decorated by several foreign rulers and is the recipient of honorary degrees from a very great number of prominent universities at home and abroad. He has published 'The Meaning of Education' (1898, rev. enlarged ed., 1900); 'True and

False Democracy’ (1907); ‘Philosophy’ (1908, 3d ed., 1911); ‘The American as He Is’ (1908); ‘The International Mind’ (1912); ‘Why Should We Change our Form of Government’ (1912); ‘Progress in Politics’ (1913); ‘Monographs on Education in the United States,’ exhibit at the Paris Exposition (1900); ‘A World in Ferment’ (1917).

BUTLER, Samuel, English satirical poet: b. Strensham, Worcestershire, 12 Feb. 1612; d. London, 25 Sept. 1680. He passed some time in his youth at Cambridge, but never matriculated at the university. He was afterward clerk or steward to several country gentlemen, and later lived in London. He resided some time with Sir Samuel Luke, a commander under Cromwell. In this situation Butler acquired materials for his ‘Hudibras’ (q.v.) by study of those around him, and particularly of Sir Samuel himself, a caricature of whom constituted the celebrated knight Hudibras. The first edition of ‘Hudibras’ was published in 1663 and was brought under the notice of the court by the well-known Earl of Dorset. It immediately became highly popular with the prevailing party in Church and state, and served as a general source of quotation; the King himself perpetually answering his courtiers out of ‘Hudibras.’ Celebrated as it rendered its author, it did nothing toward extricating him from indigence. He was buried in Saint Paul’s Church, Covent Garden, at the expense of his friend, Mr. Longueville, of the Temple, and a monument was, 40 years after, erected to his memory, in Westminster Abbey, by Alderman Barber, the printer. ‘Hudibras,’ both in its style and matter, is one of the most original and witty works that were ever written. As a work intended to ridicule the Puritans its attraction was great but temporary, but as applicable to classes of character found in all ages, its satire will always be relished. Butler’s ‘Remains in Verse and Prose’ appeared in 1759.

BUTLER, Samuel, English author and composer: b. Langar, 4 Dec. 1835; d. London, 18 June 1902. He was educated at Shrewsbury School and Cambridge University. After graduation in preparation for the ministry he did parish work among the poor of London. In 1859 he sailed for New Zealand and became a successful sheep farmer. He returned to England in 1864 and studied art. With Henry Festing Jones, he composed many gavottes, figures, etc., and the cantata of ‘Narcissus.’ He was also an artist of merit, and for several years exhibited at the Royal Academy. He is best known as a brilliant, original writer in more than one field, and as a master of irony had few equals among his contemporaries, in this particular more nearly approaching Swift than anyone else. His published books include ‘A First Year in Canterbury Settlement’ (1863); ‘Erewhon, or Over the Range’; ‘Fair Haven,’ an ironical defense of Christianity (1873); ‘Life and Habit’ (1877); ‘Evolution, Old and New’ (1879); ‘Unconscious Memory’ (1880); ‘Alps and Sanctuaries of Piedmont and the Canton Ticino’ (1881); ‘Luck or Cunning as the Means of Organic Modification’ (1886); ‘Ex Veto’ (1888); ‘Life of Dr. Samuel Butler, Bishop of Lichfield’ (1896); ‘The Authoress of the Odyssey’ (1897); ‘The Iliad of Homer, Rendered into English Prose’ (1900); ‘Erewhon Revisited’ (1901); and ‘The Way of All Flesh’ (New York 1903), published posthumously, his best and most popular work. Consult Harris, John F., ‘Samuel Butler: the Man and His Work’ (New York 1916).

BUTLER, William, English polemical writer: d. about 1410. He was the 30th provincial of the Minorites in England. At Oxford in 1401 he wrote a tract against the translation of the Bible into the vulgar tongue. He also wrote a tract, ‘De Indulgentiis,’ four books of commentaries on the ‘Sentences of Peter Lombard’ and several tracts against the Wycliffites. He removed to Reading from Oxford. Consult Brewer, ‘Monumenta Franciscana’ (London 1858).

BUTLER, William Archer, Irish clergyman and philosopher: b. Annerville about 1814; d. 5 July 1848. He was baptized and educated as a Roman Catholic, but became a convert to the Established Church before entering Trinity College, Dublin. He was graduated in 1834 and spent the next two years in residence as a scholar. In 1837 he was appointed to the new chair of moral philosophy at Trinity, was ordained a minister of the Established Church and was presented to the prebend of Clondehorka, Donegal. In 1842 he was promoted to the rectory of Raymogby. He was an able preacher and an indefatigable pastor. In 1845 the Roman Catholic controversy occupied Butler and he contributed to the *Irish Ecclesiastical Gazette* a series of ‘Letters on Mr. Newman’s Theory of Development.’ During the famine years of 1846–47 Butler’s efforts were untiring as relief officer of his parish. His lectures were issued after his death as ‘Lectures on the History of Ancient Philosophy’ (2 vols., Cambridge 1856). Other works are ‘Sermons, Doctrinal and Practical’ (3d ed., Cambridge 1855); ‘Eternal Life of Christ in Heaven’ (1845). Consult the memoir by the Rev. Thomas Woodward (Dublin 1849) and *Dublin University Review* (July 1849).

BUTLER, Sir William Francis, British general: b. Tipperary County, Ireland, 31 Oct. 1838; d. London, 7 June 1910. He was educated at Dublin, and joined the army in 1858. In 1863 he became lieutenant, and in 1874 was promoted to the rank of major. He served on the Red River expedition of 1870–71, and about the same time was sent on a special mission to the Saskatchewan territories. He accompanied the Ashantee expedition in 1874, and in 1879 acted as staff officer in Natal. He also served in Egypt in 1882, and held important commands under Lord Wolseley in the Sudan campaign of 1884–85. From 1890 till 1893 he was in command at Alexandria, and in 1892 was raised to the rank of major-general. He had command of the 2d Infantry Brigade at Aldershot, 1893, and of the southeastern district at Dover, 1896–98. In 1898 he became commander of the forces in South Africa, and for a time, during the absence of Lord Milner, was acting high commissioner. He was strongly opposed to Milner’s policy with regard to the rights of the “outlanders” in the Transvaal, and refused to transmit their petition to the home government,— an action which, among other causes of friction, led to his recall. He had command of the western district, 1899–1905, and concurrently that of the Aldershot district, 1900–01. He published 'The Great Lone Land: A Narrative of Travel and Adventure in the Northwest of America' (1872); 'The Wild North Land' (1873), the story of a winter journey across northern North America; 'Akim-Foo' (1875), a story of the Ashantee War; 'Far Out' (1880); 'Red Cloud, the Solitary Sioux' (1882); 'The Campaign of the Cataracts' (1887). He was created K.C.B. in 1886 and in 1900 was appointed lieutenant-general. His wife (née Elizabeth Thompson) is famous as a painter of battle scenes. His autobiography, edited by his daughter, was published in 1911.

BUTLER, William Morris, American physician: b. Maine 1850. He was educated at Hamilton College, the New York College of Physicians and Surgeons and at the École de Medicine, Paris; has been professionally connected with several homœopathic hospitals, and has been professor of nervous diseases at the Metropolitan Postgraduate School of Medicine, New York; is professor of mental diseases at Flower Hospital, New York, consulting alienist at the Middletown State Insane Hospital. He has published 'Home Care for the Insane' and 'Mental Diseases and Their Homœopathic Treatment.'

BUTLER, William Orlando, American general: b. Jessamine County, Ky., 1791; d. Carrollton, Ky., 6 Aug. 1880. He was about devoting himself to the legal profession when the War of 1812 broke out. Enlisting as a private soldier in Captain Hart's company of Kentucky volunteers he gained distinction in the battles at Frenchtown and the river Raisin. Subsequently he took a conspicuous part in the battles of Pensacola and New Orleans, was brevetted major, 23 Dec. 1814, acted as aide-de-camp to General Jackson from 17 June 1816 to 31 May 1817, when he tendered his resignation, resuming for the next 25 years the profession of the law. From 1839 to 1843 he served as a representative in Congress from that district, in the interests of the Democratic party. Nominated as a candidate for governor of Kentucky in 1844, he was defeated by the influence of Clay. Created major-general, 29 June 1846, he led with great spirit the daring charge at Monterey, and although wounded on that occasion, still remained for several months with the army. On 18 Feb. 1848 he succeeded General Scott in command of the army in Mexico. The most important operation during his tenure of this office was the defeat of Padre Jarauta and his guerrilla forces by General Lane. His military administration in Mexico was brought to a close on 29 May 1848, when he announced the ratification of the treaty of peace. After his return to the United States he was nominated in 1848 by the Democratic party as candidate for the vice-presidency. He was the author of 'The Boatman's Horn and Other Poems.' Consult Blair, 'The Life and Public Service of William O. Butler' (Baltimore 1848).

BUTLER, Zebulon, American military officer: b. Lyme, Conn., in 1731; d. Wilkesbarre, 28 July 1795. He served in the French and Indian War, and in the Revolutionary War also. He commanded the garrison at Wyoming Valley at the time of the massacre of 3 July 1778, and in 1779 served in Sullivan's expedition against the Indians.

BUTLER, Mo., city and county-seat of Bates County, 75 miles southeast of Kansas City, on the Missouri Pacific Railroad. Agriculture and coal-mining are the principal industries. The city owns and operates the sewerage system and the electric-lighting plant. Pop. 2,894.

BUTLER, Pa., borough and county-seat of Butler County, situated on the Conequessing Creek, and on the Pennsylvania and other railroads, 30 miles north of Pittsburgh. It is the centre of a region having coal, iron, oil and natural gas. The chief industry is glass manufacture, and there are also flouring and planing mills, oil-well supply manufactories, also of silk, buttons, carriages, paint, beds of metal. Its noteworthy buildings are a hospital, courthouse and public library. Butler was first settled in 1778 and was incorporated in 1803. The government is vested in a burgess and council, the former being chosen for a three-year term. Pop. 20,728.

BUTLER UNIVERSITY, a coeducational (non-sectarian) institution in Irvington, a suburb of Indianapolis, Ind.; organized in 1855 as Northwestern Christian University. Its departments include an undergraduate college, a normal course, departments of art and education, a summer school and extension courses. It has about 540 students, 19 instructors, a library of 13,000 volumes, an endowment of $395,000, an income of $45,000 and property valued at $212,000.

BUTLEROV, Alexander Mikhailovich, Russian chemist: b. Tchistopol, Kazan, 1828; d. Saint Petersburg 1886. He received his university training at Kazan, and was successively professor of chemistry and rector there after 1858. After 10 years at Kazan he removed to Saint Petersburg as professor of chemistry at the university there. He did very important work in organic chemistry, discovered the tertiary alcohols and wrote a masterly treatise on organic chemistry. He believed in spiritualism and is the author of a French work entitled 'Etudes psychiques.' He also contributed to the literature of apiculture.

BUTO, an Egyptian goddess whom the Greeks identified with Leto or Latona. She was represented under the guise of a serpent, and the city of Buto, which took its name from her, is supposed to have occupied a site on an island in the modern Lake Burlos in the delta of the Nile.

BUTON, boo'tōn, **BOETON,** or **BUTUNG,** an East Indian island, southeast of Celebes, belonging to Holland. Its area is about 1,700 square miles. It is fertile and densely wooded, and is governed by a native chief, subject to the Dutch government. The chief products are tropical fruits, rice and maize. The population, mainly Malays, is about 100,000. The chief town is Buton at the southwestern end of the island.

BÜTSCHLI, büt'shlē, **Otto,** German zoologist: b. Frankfort-on-the-Main 1848. Since 1878 he has been professor of zoology in the University of Heidelberg. He was one of the first to establish knowledge of nucleus and cell division, and his writings upon protoplasm and bacteria have been widely read and discussed. He has published 'Protozoen'; 'Untersuchungen über mikroskopische Schäume und das Protoplasma' (1892); 'Untersuchungen über die Mikrostructur künstlicher und natürlicher Kieselsäuregallerten' (1900); 'Mechanismus und Vitalismus' (1901); 'Vorlesungen über vergleichende Anatomie' (1910).

BUTT, Archibald Willingham, American army officer: b. Augusta, Ga., 26 Sept. 1866; d. 15 April 1912. He received his education at the University of the South, became a newspaper correspondent for some years and in 1900 was made captain of volunteers. Afterward he received a commission in the regular army, served as quartermaster in the Philippines, Washington and Havana. In 1911 he was made a major. He was personal aide to President Roosevelt in 1908, and to President Taft from 1909 till his death on the *Titanic*, returning from Europe. Washington is graced with a fountain in memory of him.

BUTT, Isaac, Irish politician; the first to make political use of the phrase «Home Rule»; was the son of a Protestant rector: b. County Donegal, 16 Sept. 1813; d. 5 May 1879. Educated at Raphoe and at Trinity College, Dublin, he gained a brilliant reputation for his accomplished scholarship. In 1852 he was elected to Parliament as a Liberal Conservative for Youghal, for which constituency he sat until 1865. He defended Smith O'Brien and others in the state trials of 1848, and with equal fearlessness and self-devotion all the Fenian prisoners between the years 1865 and 1869. In 1871 he was elected for the city of Limerick to lead the Home Rule party. He published 'History of Italy' (1860) and 'The Problem of Irish Education' (1875).

BUTTE, būt, Mont., city and county-seat of Silverbow County, on the Great Northern, the Northern Pacific, the Chicago, Milwaukee and Saint Paul and other railroads. It is on the high plateau between the Rocky Mountains and the Bitter Root Mountains, 5,800 feet above the sea-level. The city is well-built, the more imposing buildings being the city hall, courthouse and jail, opera-house, the Federal building and a fine public high school, completed at a cost of $125,000. The Montana State School of Mines is located here. It has several fine theatres and a good public library. The Columbia Gardens also deserve mention. The public school system is excellent, and there is a public library of more than 35,000 volumes. Butte is the largest mining town in the world, employing thousands of persons in this industry alone. Copper is the chief production, although there are valuable deposits of gold and silver, lead and zinc. The Great Anaconda Copper mine is here, and many other valuable mining properties are within a radius of a few miles of the city. The copper production alone is about 25 per cent that of the United States and 13 per cent that of the world, and the total annual mineral output is estimated at more than $60,000,000. Probably no city of equal size in the country is so exclusively given over to a single industry. It has also manufactories of candy, cigars, mattresses and other minor industrial interests. In 1914 there were 108 establishments with $2,393,000 capital, employing 904 persons. The salaries and wages amounted to $890,000. The products were valued at $2,907,000 and were made from materials costing $1,317,000.

Butte is the trade and jobbing centre for southern and western Montana; has an extensive trolley system; gas and electric lights; national and other banks; and several daily and weekly newspapers. Butte is governed by a mayor, elected biennially, and a city council. It spends annually about $200,000 for schools, and about $50,000 each for the fire, police and street-cleaning departments. Butte was settled as a gold-placer camp in 1863, laid out as a town in 1866, and grew rapidly after the successful opening up of quartz mining in 1875. It was incorporated by the territorial legislature in 1879, and reincorporated in 1888. In 1881 it was made the county-seat of Silverbow County. Pop. in 1870 about 300; (1880) 3,363; (1890) 10,723; (1900) 30,470; (1910) 39,165; (1918) about 75,000, if suburbs are included. Consult Davenport, 'Butte and Montana beneath the X-ray' (Butte 1909); Freeman, 'A Brief History of Butte' (Chicago 1900).

BUTTE, a hill which rises abruptly from the surrounding ground. Such hills are common in the region of the American Rockies, and the term is sometimes applied to high mountains which are more or less isolated from other peaks. See MESA.

BUTTER, a product of milk, particularly cow's milk, consisting chiefly of its fatty constituent. It is obtained by churning or otherwise violently agitating milk or its cream, and working the product to remove water and other constituents. Butter fat is not a simple fat, but is a mixture of several fats, which are individual compounds of glycerine and several distinct fatty acids. The principal fats in butter are olein, which constitutes 35 per cent; palmitin, 26 per cent; and myristin, 20 per cent. Laurin, butyrin and caproin are present in much smaller proportions, and there are also very small percentages of caprin, stearin, caprylin and other constituents. It has a specific gravity of 0.91 and a melting point of about 92° F.

Butter has been in use from early historic days. It is first mentioned in the Bible in Gen. xviii, 8. It was used as food and medicine, as an ointment and for burning in lamps. The Greeks probably learned of it from the Scythians or Thracians, and the Romans from the Germans. It was made from the milk of sheep and goats, and later of cows, the method of making being to jar the milk roughly by placing it in skin bags or pouches hung over the backs of trotting horses. Formerly butter was prepared by direct churning of the whole milk; this was both laborious and wasteful of butter-fat. To reduce labor and loss the system of setting the milk and skimming off the cream was evolved; since 1877 this method has given way in considerable measure to the use of centrifugal force for the separation of the cream and milk.

The making of good butter begins with the cow. She must be healthy and be well fed. The essential next in importance is absolute cleanliness in the care of the milk. The dairy utensils should be of tin, and never used for any but dairy purposes. They should not be continued in use after the tin plating begins to wear off. They should be washed with a brush, never with a cloth, and with hot water and sal soda or borax, and not with soap. The final rinsing should be with boiling water, after which they should be drained and allowed to dry without wiping. The process of making butter is divided into the operations of creaming, churning, working and finishing. The fat exists in the form of small globules in the milk, in suspension. In the setting system the milk is placed in shallow pans about four inches high, or in deep ones of about 18 inches, and advantage is taken of the fact that the fat globules, being lighter than water and other constituents of the milk, rise to the surface by the action of gravity. Large fat globules will rise more rapidly than small ones, and the size of the globules varies with different breeds of cattle. In the milk of Jersey cattle they are 1/8000 of an inch in diameter; in Holstein cattle 1/12000 of an inch in diameter. In the shallow-pan system the milk is set as soon as possible after it is drawn, and the cream is skimmed off in 24 to 36 hours. This system is wasteful in that the skim-milk often contains 0.5 to 1.5 per cent of fat. The deep-setting system is less wasteful, the fat in the skim-milk being often reduced to 0.2 per cent. The new-drawn, warm milk is placed in cans surrounded by or submerged in water of about 40° F., and the rapid reduction in temperature causes the globules to rise quickly. It is best to skim the cream at 30 to 40 lactometer: that is, 10 gallons of milk should yield 1 to 1⅓ gallons of cream. The cream is removed by dipping it off, or the skim-milk is drawn off from the bottom of the can. The fat left in the skim-milk consists of the smallest fat globules.

The introduction of the separator and use of centrifugal force has resulted in a more perfect and rapid separation. This force exceeds that of gravity a thousand-fold. The system of separation is continuous, a constant, uniform flow of milk being conducted into a bowl or drum revolving at from 5,000 to 9,000 or more revolutions per minute. The inlet tube is in the centre of the bowl and reaches almost to the bottom; here the constituents in the milk separate, the heavier serum gravitating to the circumference of the bowl, the fat — the lightest portion — remaining in the centre. These are forced upward by the incoming milk, and the separated milk escapes through a side tube, while the cream passes through a small outlet in the centre. This last outlet can be closed or opened in some machines, thus regulating the percentage of fat in the cream. The machines are of various sizes, from those worked by hand power and doing 200 to 500 pounds of milk per hour, to power machines of 2,000 pounds and over per hour capacity. Some makes have appliances within the bowl to increase the efficiency. A good separator, well run, will not leave more than from 0.05 to 0.1 per cent of fat in the separated milk. The temperature should be kept between 85° and 95° F. for the best results and the speed should not lag.

The cream may be churned at once if sweet cream butter is desired, or «ripened» or soured. The aim of ripening is to develop certain flavors in the butter, and a certain degree of acidity which aids in churning and influences the texture. Since the discovery that the changes which commonly take place in milk are due to the action of micro-organisms, it has become a part of the butter maker's task to make use only of such organisms as will aid in his work, and eliminate those which tend to impair the product. It has been found that the flavor of butter depends in very large degree upon the kind of bacteria which accomplishes the souring of the cream preliminary to churning. The scientific butter maker, therefore, prepares a «culture» of the beneficial bacteria, keeping it free from all others. In the usual procedure of butter-making on the farm, a «starter,» used to start the acid fermentation in the newly-skimmed cream, is saved from the preceding batch of sour cream, or from the buttermilk of the preceding churning. This naturally contains a mixture of many bacterial ferments, and too often a large proportion of those which are injurious to butter quality. It is advisable to make the starter out of sweet skim-milk, two or three gallons for each 10 gallons of the cream to be soured. Place it in a covered vessel in a temperature between 75° to 85°. It will require from 18 to 24 hours to become thick. It should be distinctly but pleasantly acid. The top inch should be rejected, as it contains the undesirable bacteria. It is not always easy to obtain the starter from the milk of a mixed herd. In this case it is best to make the starter from the milk of one cow chosen after experiments as to which milk makes the finest-flavored butter. Or, as is the habit in many dairies, a pure culture may be purchased (by mail) from the nearest agricultural experiment station and a «mother culture» established from that. One of the essentials in making good butter is the proper care of the cream after churning: if it is to be churned the next day it should be mixed at once with the starter and placed in a temperature of 65° to 70°. If it is to be churned the second day, it should be cooled to 55° to 60°; and if not till the fourth day, it should be cooled to 40° F. Warm cream, fresh from the separator, should never be added at once to the cooled cream: it should first be cooled to the proper keeping temperature. The starter should be mixed in at such a time that the cream will reach the desired degree of acidity by the time it is desired to churn. The degree of acidity may be determined by various tests.' The most effective acidity is from 0.6 to 0.7 per cent. When possible it is advisable to pasteurize the milk or cream. This is accomplished by heating the milk or cream to 145° F. for 30 minutes, then rapidly raising it for a moment to 185°, and then as rapidly cooling it to 75° or 80°. This destroys about 98 per cent of all the bacteria. It does not, however, destroy the spores, and when making pure cultures of lactic acid bacteria, it is the rule to repeat the pasteurization daily for four days. Into the pasteurized cream is stirred the starter, 18 to 24 hours before the churning is planned, the cream meanwhile being held at a temperature of 52° to 54° in summer, and 58° to 62° in winter. The cream should be strained into the churn, and the churn should be not more than one-third full. A box or barrel churn is the best, and the churning should not be too fast, the idea being to keep the liquid measurably in one body which is thrown forcibly from one end of the churn to the other. In the dasher churns much of the cream is overchurned, producing a greasy butter. When the granules of butter are fairly uniform in size and have the general appearance of cracked corn, the churning is done. It takes about 30 minutes. The buttermilk should be strained away, and the butter washed with about the same quantity of water as there was cream in the beginning. Too much water will yield a tasteless butter. The butter is then to be worked by pressure, never by a rubbing motion, which destroys the grain. A wedge-shaped or square butter-worker is preferable. The butter is usually salted immediately after washing, and before working, the amount of salt used being about one and one-half ounces to the pound of butter. When the washing is done in the churn, the salt is sometimes added in the form of brine composed of one pound of salt to two pounds of water for each 10 pounds of butter. The churn is then set in operation for two or three minutes, and the butter is allowed to stand 15 minutes in the brine before working.

The most common defects of farm-made butter are: (1) Rancidity, due to the cream being too old, or too sour, or having been kept too warm before churning; (2) foul flavor, from having been allowed to absorb bad odors; and (3) «mottles,» from buttermilk being worked into the butter instead of having been worked out. Scrupulous cleanliness and attention to details from the feeding of the cows to the placing of the product on the market are imperative. See BUTTER WORKER; CHURN; DAIRY INDUSTRY.

The composition of butter varies. It ranges from 78.88 per cent to 88.41 per cent of milk fat; 7.22 per cent to 15.62 per cent of water; 1.03 per cent to 3.32 per cent of casein, and 1.34 per cent to 4.16 per cent of salt. The best butter has a content of 85 to 86 per cent of milk fat and from 13 to 14 per cent of water. The quality of butter is judged by its flavor, texture, color, amount of salt and general appearance. Flavor counts about 45 per cent of the points, and varies with the market. Some markets require a mild, delicate butter; for the supply of such the cream is often pasteurized: others require a high flavor, almost verging on rancidity. Whatever is desired, that flavor should be pronounced, with an absence of rancidity or other flavors. Texture carries 25 per cent of the points and depends upon the granular condition of the fats. The more distinctly the granules show up when the butter is broken the better the texture. The right color depends upon the market requirements; usually a bright golden yellow, as naturally yielded when cows are on grass, is considered ideal. It should be uniform. To ensure this, it is sometimes necessary to use some butter-color: formerly the main one used was arnotto; now the coal-tar colors, aniline yellow and butter yellow are used. The vegetable coloring matter is usually dissolved in some oil, and this often gives a peculiar flavor to the butter, so that the coal-tar colors are preferred. Some South American countries require the butter to be a deep orange or red color. A small quantity of salt is often added to improve the palatability; it has little influence on the keeping qualities. The amount varies with trade requirements. Unsalted or slightly salted butter is largely used in Europe and the United Kingdom. The finish and packing of the butter should be attractive and neat. The styles are numerous, but attempts are being made to standardize them. The American butter-tub is generally used here. It holds from 50 to 70 pounds. In Canada and Australia a box holding 56 pounds is used for the export trade. The Danes ship their butter in firkins containing 112 pounds. For local trade the standard rectangle pound print is 4⅝×2½×2⅜ inches. These are wrapped in parchment paper and packed in specially made boxes.

Oleomargarine is the most common adulterant, and its detection, especially when present in only small amounts, is difficult. Cottonseed and other oils have been used. Glycogen has been added to increase the water-holding capacity of the butter, and in butters for South America glucose has been added as a preservative. The various preservatives, as borax, boracic acid, etc., sold under their own and other names, are now prohibited as adulterants.

Renovated or process butter is generally low-grade butter which has been melted and put through a chemical process to remove the disagreeable odors and taste; sometimes it is then mixed with soured separated or whole milk or cream and churned until granulated. If the primary article is not too inferior, the resulting product can be sold as good creamery butter; generally its keeping qualities are impaired. In some States and in the United Kingdom all butter so treated must be distinctly branded «Renovated.»

During the year 1850 the amount of butter made on farms in the United States was 313,345,306 pounds. As reported by the United States census of manufactures for 1914 the production of butter in that year amounted to 786,013,489 pounds, valued at $223,179,254, as compared with 627,145,865 pounds, valued at $180,174,790, in 1909, representing an increase of 25.3 per cent in quantity and 23.9 per cent in value.

The farm production of butter (including that made for home consumption) is probably greater than the factory output, and a relatively small quantity of cheese is also manufactured on farms. Statistics in regard to the farm output of these commodities, however, are collected only once in 10 years. At the census of 1909, 994,650,610 pounds of butter were reported as made on farms. These amounts represented decreases in the decade of 7.2 per cent and 42.6 per cent, respectively, as compared with 1899. The value of that made on farms ranged in 1915 from 21 cents to 32 cents per pound, depending on location more than upon quality. Creamery-made butter brought from 24 cents for ordinary to 38 cents for extra fancy. The lower prices were generally those of the summer months and the highest ones of midwinter. The cost of transporting the milk to factories is about 1.5 cents per pound of butter. Denmark is at present the leading butter-exporting country of the world, with a record of almost 165,000,000 pounds, valued at $37,000,000, the average price being the highest on the market. The butter exports of the United States in 1915 amounted to 9,850,704 pounds.

The coefficient of digestibility of butter-fat is 98 per cent or over. It is well assimilated, and, like other fats, is a source of heat and energy. Its value as a food and methods of usage are well known. Butter containing 82.4 per cent butter-fat has a fuel value per pound of 3,475 calories, and in a number of dietary studies butter furnished 1.9 per cent of the total food, and 19.7 per cent of the total fat of the daily food. Further information is given in Professor Atwater's reports on dietary studies. Fresh and salt butter are equally valuable. Clarified butter is used in cooking. It is ordinary butter freed from water by heating.

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BUTTER, Artificial. See OLEOMARGARINE.

BUTTER-BUR (*Petasites petasites*), a composite plant, with large rhubarb-like leaves and purplish flowers, growing by the side of streams, allied to coltsfoot. The flowers appear before the leaves. It is a native of Europe, but has become naturalized in a few localities in the eastern United States.

BUTTER-COLOR, a preparation employed to color butter and its imitations. Annatto was formerly largely used for this purpose, but is now superseded by coal-tar colors and other coloring substances such as tumeric, saffron, marigold leaves, carrot juice and chrome yellow. Owing to the small quantities used in coloring butter they are quite harmless.

BUTTER AND EGGS, a troublesome weed. See TOAD-FLAX.

BUTTER-FISHES. The two best known butter-fishes in American waters are denizens of the Atlantic. One (*Poronotus triacanthus*) is the butter-fish or dollar-fish of the coast of Massachusetts and New York, the harvest-fish of New Jersey, the dollar-fish of Maine, the sheepshead of Cape Cod, the pumpkinseed of Connecticut and the star-fish of Norfolk. It swims mostly in company with large jelly-fish, whose streamers, while often protecting it from other depredators, are frequently the cause of its death from their stings. The body is ovate and flat, the dorsal and anal fins are each very pointed, and the tail is long and widely forked.

The harvest-fish (*Peprilus paru*) is another "butter-fish" found from Cape Cod southward to Brazil, but it is most abundant about the mouth of Chesapeake Bay, where it is locally called "whiting." It has the habit of swimming beneath the Portuguese man-of-war. It is a delicious little pan-fish, about six inches long. On the Pacific coast there are three species, one of which (*P. simillima*) is the Californian "pompano," abundant during summer about Santa Cruz, where it is highly prized for its rich and delicate quality, and reaches 10 inches in length. Consult Jordan and Evermann, 'American Food and Game Fishes' (1902).

BUTTER-MAKING. See BUTTER.

BUTTER-TREE, various tropical or subtropical trees of different genera and even families. Their seeds yield fixed oils which resemble butter and are similarly used or are employed for lighting. The leading group is perhaps the genus *Butyrospermum* of the family *Sapotaceæ*. Of this genus the best-known species are *B. longifolium*, the Indian oil-tree, whose wood resembles teak, and is in use in the East; *B. butyraceum*, the Indian butter-tree, whose light wood is of no commercial importance; and *B. latifolium*, the East Indian Mahowa, Mahwa or Madhuca. Besides the oil obtained from each of these trees, *B. butyraceum* yields an edible fruit, and the corollas of *B. latifolium* are either eaten raw or are used for making a liquor or for distilling their essential oil. *Butyrospermum parkii* is the butter-tree of central Africa. It yields the galam or shea butter, obtained by boiling the seeds, which is locally an important article of commerce. The oil is obtained by boiling the kernels of the sun or kiln-dried seeds in water. It possesses long keeping qualities. Various species of the genus *Caryocar* (q.v.), natives of South America, are known as butter-trees.

BUTTER-WORKER, a machine designed to unite the small particles of butter, remove the buttermilk and water and incorporate the salt, giving the product a uniform appearance. Hand and power machines are made, the large power workers being also used for blending butters to make them uniform. The makes are variable and numerous; some being combined with a churn, the butter not being removed until it is finished. The former method of working by the hands injured the texture of the product and was too slow. With the present machinery the butter is untouched by hand, can be held at a temperature of 45° to 55° F. during working and is handled expeditiously. They are a necessity in all creameries and dairies where butter is made in large quantities. See also BUTTER; CREAMERIES; DAIRYING.

BUTTERCUP, the popular name of two or three species of the *Ranunculus* (q.v.).

BUTTERFIELD, Daniel, American soldier: b. Utica, N. Y., 18 Oct. 1831; d. Cold Spring, N. C., 17 July 1901. In 1849 he was graduated at Union College, and for some years engaged in the transportation and express business. At the outbreak of the Civil War he was colonel of the 12th New York Militia. He served in the Peninsular campaign and under Pope and McClellan in 1862. At Fredericksburg he commanded the 5th Corps, and at Chancellorsville and Gettysburg was chief of staff. He served as chief of staff to Hooker at Lookout Mountain, and Ringgold and Pea Vine Creek, and commanded a division at Buzzard's Roost, Resaca, Dallas, New Hope Church, Kenesaw, Lost Mountain and other battles. He was brevetted major-general in the regular army. He resigned in 1869, and became chief of the United States sub-treasury in New York. He organized and commanded the Washington centennial parade in New York city in 1889, in which over 100,000 persons took part. He was author of 'Camp and Outpost Duty' (1862). He is buried in the West Point military cemetery, an elaborate and costly marble tomb marking the spot. Consult Butterfield, (Mrs.) J., 'Biographical Memorial' (New York 1904).

BUTTERFIELD, Kenyon Leech, American educator: b. Lapeer, Mich., 11 June 1868. He was educated at the University of Michigan and at the Michigan Agricultural College, and became assistant secretary at the last-named institution. In 1892 he began to edit the *Michigan Grange Visitor* and in 1896 became head of a department of the *Michigan Farmer.* From 1895 to 1899 he also served as superintendent of the Michigan Farmers' Institute and field agent of the Michigan Agricultural College. In 1902–03 he was instructor in rural sociology at the University of Michigan, and in the latter year was named president of the Rhode Island College of Agriculture and Mechanical Arts. In 1906 he was made president of the Agricultural College of Massachusetts. He published ‹Chapters in Rural Progress› (1908); ‹The Country Church and the Rural Problem› (1911) and contributions on professional topics in agricultural periodicals.

BUTTERFIELD, William, English architect: b. 7 Sept. 1814; d. London, 25 Feb. 1900. He first attained distinction by the introduction of color into ecclesiastical buildings with the aid of bricks and mosaïc. Among the notable structures designed by him are Saint Augustine's College at Canterbury; Keble College, Oxford; All Saints' Church, Margaret street, London; and the cathedral at Melbourne.

BUTTERFLY, one of the day-flying *Lepidoptera* of the sub-order *Rhopalocera* (compare MOTH). This group is distinguished from the moths by the slender, knobbed antennæ, which are never hairy or pectinated. The body is small, but there is a greater equality in the size of the three regions (head, thorax and abdomen) than in the moths, the abdomen being much shorter and smaller, as a general rule, than in the lower families of *Lepidoptera.* The ocelli are usually wanting; the spiral tongue is long, and the broad wings are carried erect when in repose, and are not held together during flight by a bristle (frenum) and socket as in most of the moths.

The caterpillars (larvæ) vary greatly in shape and in their style of ornamentation, but they uniformly have, besides the thoracic legs, five pairs of abdominal legs. The pupa is called a «chrysalis» or «aurelian,» from the bright golden hues that adorn it in many species, but disappear as the wet tissues beneath the pupa-skin harden, just before the fly appears. A few species, such as those of the genus *Vanessa,* hibernate, while several species, such as *V. antiopa,* are social as young larvæ. Butterflies also occasionally swarm while in the perfect state, such as species of *Colias, Cynthia* and *Danais,* multitudes of which are sometimes seen passing overhead in long columns. One of the North American species, and others elsewhere, are migratory, flying southward in autumn.

Butterflies are found in all parts of the world except the coldest, wherever plants exist suitable for food for the caterpillars, but they are most numerous both in species and in individuals within the tropics, and especially in South America. About 13,000 species have been described, and it is believed that twice or three times this number are in existence. About 1,000 species inhabit North America. Butterflies are especially liable to local variation, and to seasonal and dimorphic changes, so that entomologists have recorded many sub-species and temperature-forms.

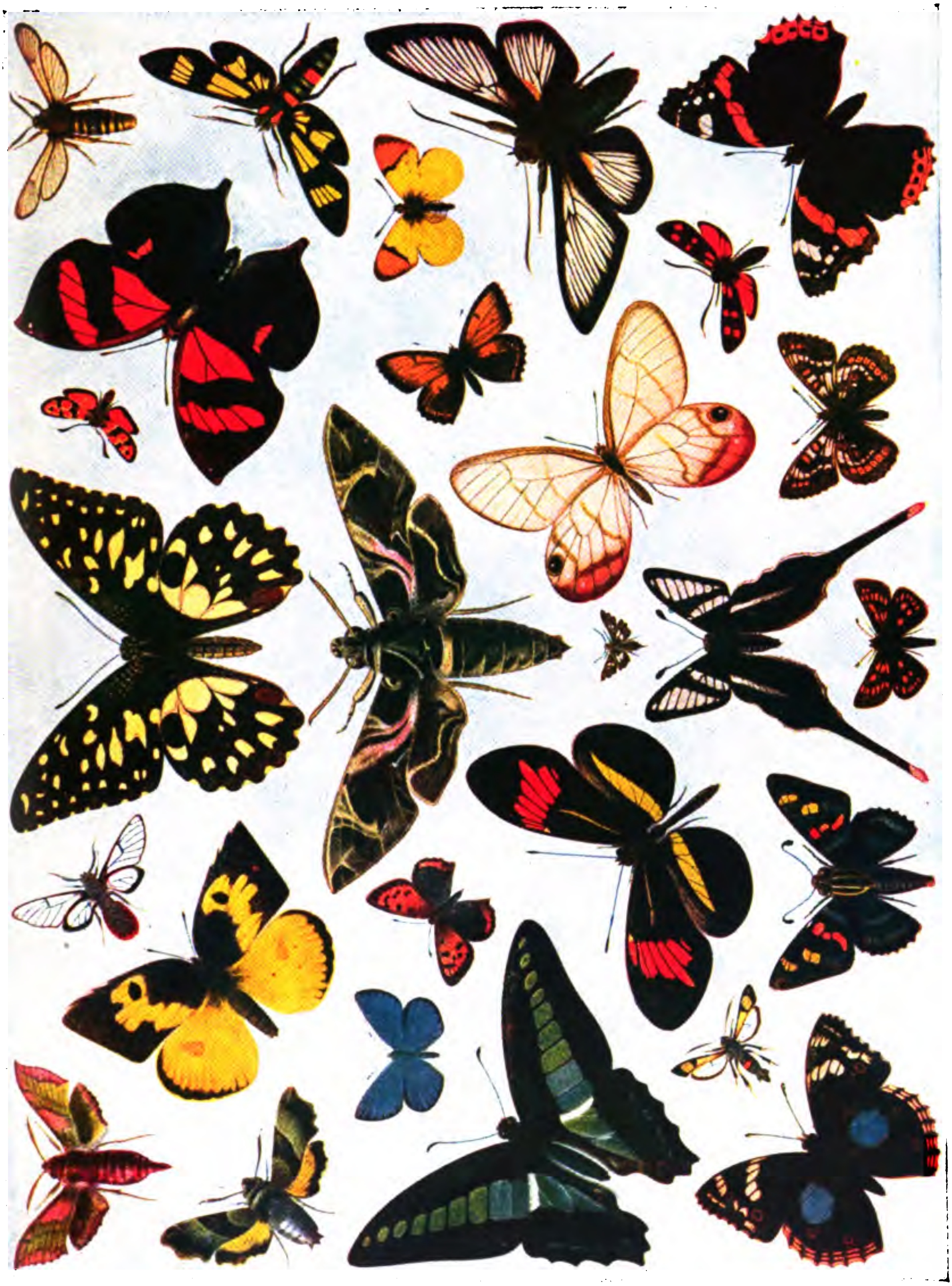
Certain *Nymphalidæ* have glands at the end of the body secreting a repulsive fluid (see MIMICRY); in others there are remarkable differences between the sexes; in certain butterflies (*Androconia*) some of the scales are battledore-shaped, and secrete a special odor. The species of *Ageronia,* a South American genus, make a clicking noise when flying. While caterpillars are plant-eaters, those of several *Lycænidæ* are known to be carnivorous, feeding on plant-lice and scale-insects.

The eggs of butterflies have a membranous shell, and exhibit much variety in form and character of surface. «Sometimes,» says Holland, «they are ribbed. Between these ribs there is frequently found a fine network of raised lines, variously arranged. Sometimes the surface is covered with minute depressions, sometimes with a series of minute elevations variously disposed.» The color is most often greenish white, but many are brightly colored, or have lines and dots of color. Another peculiarity is the minute opening (micropyle) in every egg, by which the spermatozoön may enter. The eggs are laid by the female on a plant that will afford suitable food for the caterpillar when it hatches. They may be deposited singly or in small or large masses; and those that will not hatch until after the following winter are protected in some way, as by a varnish, or otherwise, against the weather. Some butterflies are «single-brooded,» others lay eggs twice or more in a season, the early layings hatching quickly and the last lot surviving the winter to establish the species in the succeeding spring. Few adult butterflies survive the advent of the cold season in the North, the species continuing through the survival of eggs, larvæ or pupæ, the last sometimes by burial in the ground.

The caterpillars of butterflies are typically cylindrical and worm-like in form; but some are short and slug-shaped, or irregular in outline. The head is distinct, often large and formed of hard (chitinous) material; and often it bears horn-like projections or protrusile appendages. The thin skin is in many cases brightly ornamented with colors similar to those worn later by the adult fly (imago); but green and gray prevail — tints inconspicuous among the leaves and grasses on which most of the species feed. Most caterpillars live solitary lives; but in some species they are gregarious, and even weave large silken dwelling-places in which they live as a colony.

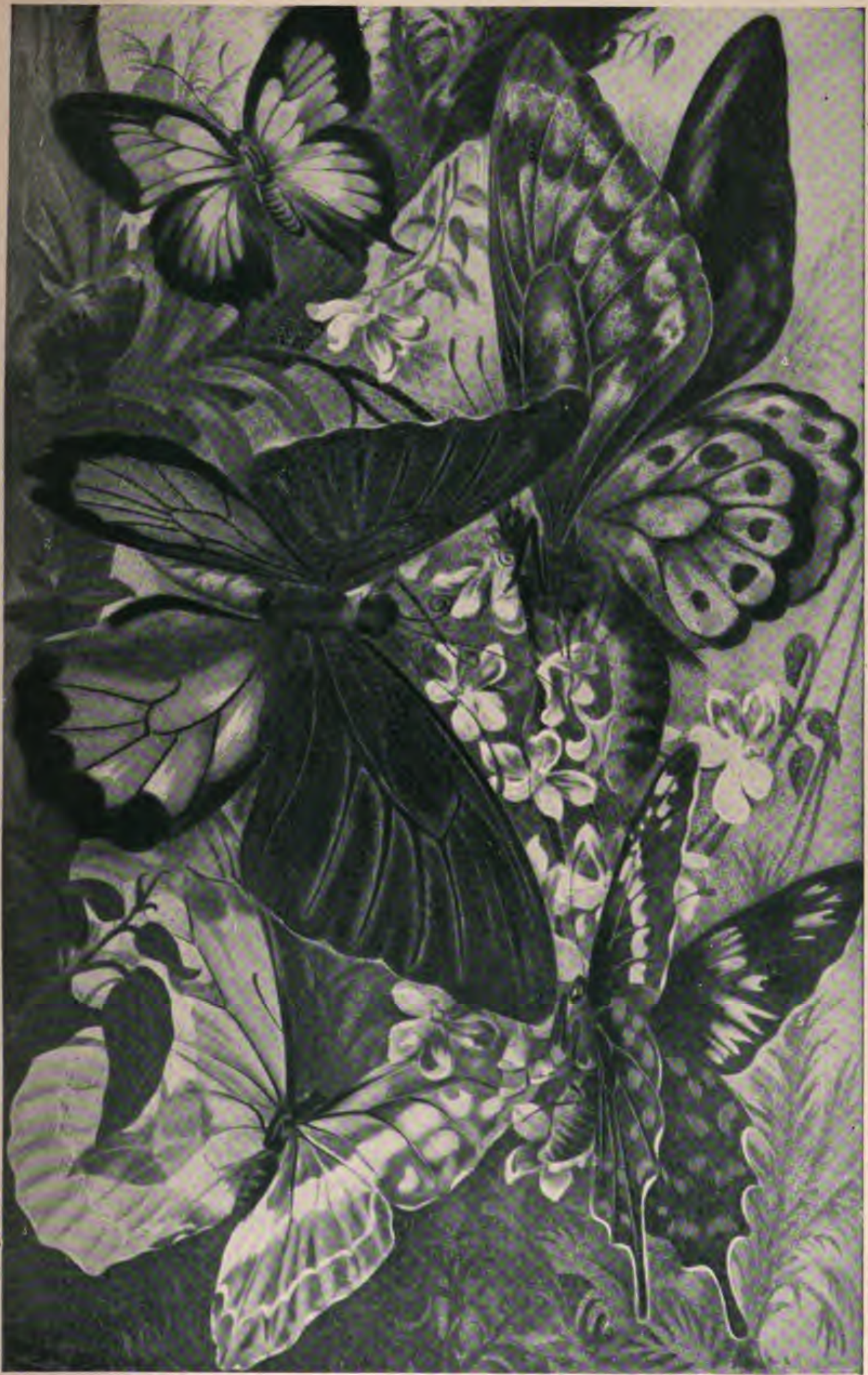
Caterpillars are able to grow by sloughing the skin, which from time to time cracks, enabling the creature to crawl out of it, and to begin another period of growth with a new and elastic skin that has formed beneath the old one. Four or five of these molts take place as a rule. When the larva is to hibernate, it usually does so after the first or second molt, and resumes feeding and growth when it wakes up in the spring.

One great distinction between moths and butterflies lies in the form and structure of the pupa — that quiescent stage of development in which the caterpillar is transformed to the imago. The term chrysalids is usually applied to the pupæ of butterflies, because no such a

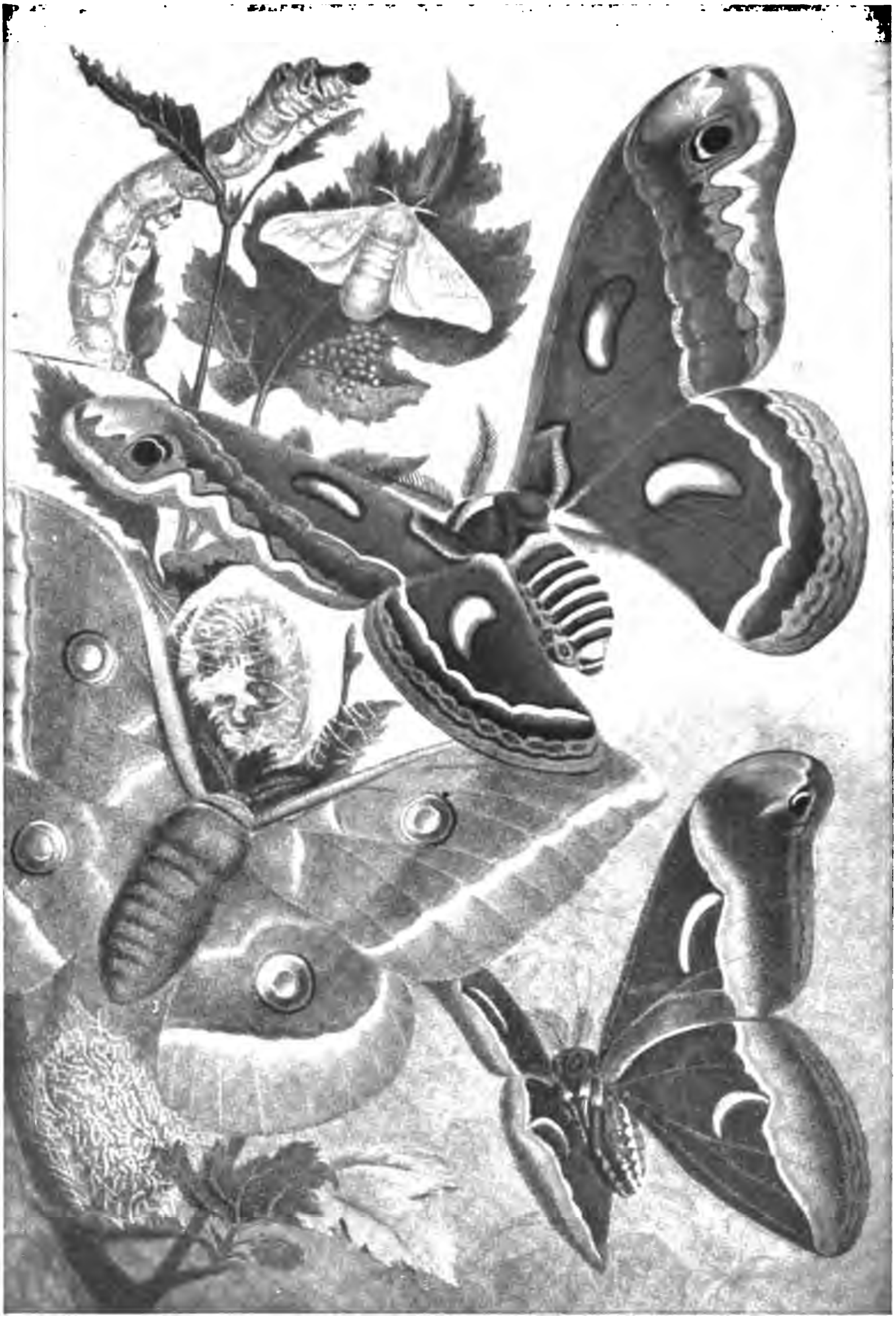


BUTTERFLIES AND MOTHS

BUTTERFLIES



1 Amblypodia Amantes
2 Ornithophera Pompeus
3 Morpho Cypris
4 Ornithophera Priamus
5 Papilio Hector



1 **Mulberry Silkworm, Caterpillar and Adult**
2 **South American Silk Moth**
3 **Chinese Silk Moth**
4 **Ailanthus Moth**

cocoon as is common among moths enwraps them. They are naked and hang free from the underside of some support, as a twig or stone, or are suspended against a surface, as the bark of a tree-trunk, attached to a «button» of silk, and held in place by a girdling thread of silk. Chrysalids are usually protectively colored.

The families of butterflies are few, and all of them, except one small tropical group (*Libytheidæ*) are represented in every continent. Following is a list of the five families recognized by American entomologists, beginning with the most primitive and ending with the most specialized: (1) *Hesperiidæ,* (2) *Papilionidæ,* (3) *Lycænidæ,* (4) *Lemoniidæ,* (5) *Nymphalidæ.* In the last three families, which comprise the majority of butterflies, the first pair of legs is more or less modified, differing from the two hinder pairs, especially in the male nymphalids, in the more or less aborted tarsi, or toe-joints.

The *Hesperiidæ,* or «skippers,» have a world-wide range except New Zealand, and are largely represented in the United States. This family contains small, prevailingly brown butterflies, with relatively large bodies and broad heads, the feelers hooked at the tip. The fore-wing is triangular and pointed in shape, and the prevailing color is brown. The hesperiids are remarkable for their short, jerky flights. The pupa is enclosed in a light, silky cocoon.

The *Papilionidæ* are a very populous family of large and handsome butterflies, familiarly called «swallow-tails» from the prolongation of the hind wing in many of them. Yellow is a prevailing color, usually ornamented with black, red-brown or some other dark tint. The wing-neuration differs characteristically from that in other families. All six feet are present in both sexes. The caterpillar is cylindrical, elongate and never hairy, but often tuberculate, and is provided with a retractile tentacle behind the head, which in some species emits a highly disagreeable odor of protective value. The pupa has two anterior projections called «nosehorns,» and hangs to its food-plant by its anal extremity, sustained by a loose girdle. This family is distributed throughout the world.

The *Lycænidæ* are a very large family of small or moderately sized butterflies with slender bodies, the feelers placed close together, and the front feet aborted in the males. The caterpillars are short and hairy, resembling woodlice in shape. The pupa has a well-marked «waist,» is clothed with hairs or bristles, is attached to a pad of silk by the cremaster and is girdled with a silken thread. This family occurs in all parts of the world, and its members are known, on account of their prevailing hues, as «blues,» «coppers» and «hair-streaks.» In alighting they always fold their wings upright.

The *Lemoniidæ* are a small family related to lycænids, which contains brilliant butterflies mostly confined to tropical America, a few bright-brown species, the «metal-marks» of the subfamily *Erycininæ,* occurring in the south-western United States.

The *Nymphalidæ* embrace a group called «four-footed» or «brush-footed» butterflies, because the foremost pair of feet in both sexes are dwarfed, hairy and held folded up against the body. This is the largest and most prominent of butterfly families, is very ancient and is much subdivided in classification. The caterpillars vary much in form, and some are hairy, or armed with spines or tubercles. The pupa hangs by its «tail,» but is not sustained by a silken girdle-thread. The nymphalids are represented in all countries, but most numerously and strikingly in tropical America.

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Ernest Ingersoll.

BUTTERFLY-FISH, or CORAL-FISH. These beautiful fish representing the large family *Chætodontidæ* and its allies of the scaly-finned group (*Squamipinnes*) of marine fishes, obtain their English names from their oval form, brilliancy and their quickness of movement, and the fact that their principal habitat is in and around the tropical coral-reefs. They are so compressed as to resemble the «pumpkin-seed» sunfishes of the ponds, and are aided in keeping their balance by a very high, arched dorsal fin and an anal fin extended beyond the tail. Their colors are always gay, usually rich orange-yellow, as a ground tint, set off by broad, black bars and fin ornaments in great variety, besides blue and red touches. The type-genus *Chætodon* is represented by several species in the West Indies, and southward, some of which occasionally drift northward in the path of the Gulf Stream. More numerous in American waters is the «black-angel» (*Pomacanthus arcuatus*), common around Porto Rico and at Key West, where it is caught in traps, or sometimes speared. The «blue-angel» (*Holacanthus ciliaris*) represents a genus containing several West Indian species, of which the most important is the «rock beauty» (*H. tricolor*), often exceeding a foot long, and good food, as well as most beautiful. The name «angel-fish» is also given in Bermuda to several similar fishes of the genus *Angelichthys,* called in Spanish «isabellitas.» All these fishes are carnivorous, and Jordan remarks that their excessive quickness of sense and motion enable them to maintain themselves in the struggle for existence in the close competition of the coral reefs, notwithstanding that they are made so conspicuous to their enemies by their bright colors. Consult Jordan and Evermann, 'Food and Game Fishes of America' (1902).

BUTTERFLY PLANT, an orchid (*Oncidium papilio*) brought from Trinidad. It is so called because its large yellow and red blossoms, poised on slender flower-stalks and vibrating with every breath of wind, resemble butterflies hovering on the wing. It is also applied to the Indian butterfly plant, *Phalænopsis amabilis,* which is another orchid.

BUTTERFLY-WEED (Pleurisy-root), a handsome American perennial herb (*Asclepias tuberosa*) of the family *Asclepiadaceæ,* common in dry ground almost throughout the United States and southern Canada. The large, irregular, yellowish-brown, tuberous roots have a nauseous, bitter taste when fresh, merely bitter when dried, and are reputed useful in lung and throat troubles, rheumatism, etc., but seem to be less popularly used than formerly. It is usually administered as a decoction, fluid extract or at times as a powder. The hairy stems, which rise to a height of two or three feet, bear alternate oblong-lanceolate leaves, and several umbels of short-peduncled, bright orange-yellow flowers followed by erect pubescent pods. Unlike other members of the genus, this plant has not a milky sap.

BUTTERINE, a substance prepared in imitation of butter, from animal or vegetable fats. The fat is first freed from all impurities, and by heat converted into olein. The olein is then transferred to a churn containing a small quantity of milk and churned into butterine. Sometimes it is colored in imitation of butter. Freshly prepared, it is sweet and palatable, and when spread on bread or cold toast is but slightly inferior to a fair quality of butter. The process has attained such perfection in the matter of manufacture in the United States that it takes an expert to distinguish it from genuine butter, and laws have been passed compelling tradesmen to label each package containing it so that no one may be deceived. See OLEOMARGARINE.

BUTTERMILK, the fluid left behind after churning milk for butter. It possesses a specific gravity somewhat higher than ordinary milk, owing to the removal of most of the fat, and varying between 1.032 and 1.035 per cent at 59° F. It may be fresh or sour, according to the method of churning. It should not contain more than 0.5 to 0.6 per cent of butter-fat. Its composition is variable, an average of 85 analyses being: Water, 90.1 per cent; casein, 3.0; fat, 1.1; protein, 4.0; milk sugar and lactic acid, 4.0; ash, 0.7 per cent. Its dry matter is practically all digestible, and it is a healthy and nutritious beverage, much relished by many people. Its fuel value per pound is 165 calories. It has about the same value as skim-milk for pig-feeding, and is used in conjunction with corn meal or some other grain, excellent pork being produced. It is also used for calf-feeding, although failures are reported in the undertaking. In fattening poultry it is highly esteemed. See BUTTER.

BUTTERNUT (White Walnut), a large spreading tree (*Juglans cinerea*) of the family *Juglandaceæ,* native of America, where it ranges from New Brunswick to Georgia and westward to the Dakotas and Arkansas. It sometimes attains a height of 100 feet but usually varies from 50 to 80. It has smooth, gray bark, large compound pubescent leaves, small flowers, followed by oblong, pointed, ribbed green nuts covered with viscid hairs. The ripe nuts when dried have very hard shells and are highly prized for dessert in regions where the trees grow; and the green nuts are used for making pickles. The bark of the stems has been used in dyeing and that of the root in medicine. The wood is used to some extent for cabinet work and interior finish of houses, but is less popular than black walnut. An inferior sugar can be made from the sap. The tree is not quite so attractive as the walnut and is less densely covered with foliage, but is less attacked by insects.

BUTTERWORT, a genus of about 30 species of small succulent plants (*Pinguicula*) of the family *Lentibulariaceæ,* widely distributed throughout the world in bogs and other wet ground. The species have rosettes or tufts of leaves, from among which single-flowered scapes rise to a height of a foot or less. The short, thick, stick-haired leaves attract small insects which are covered by the in-rolling leaf-margins and digested. The leaves of certain species, especially of the common butterwort (*P. vulgaris*) are used like rennet to coagulate milk, and thus form a favorite food in Lapland and the Alps. The milk (reindeer milk in Lapland) is poured upon the leaves, strained, allowed to stand 48 hours, or until creamy and somewhat acid, when it is ready for use as food or for impregnating other milk for the same purpose. This property is said by some authorities to account for the English name, but others attribute the name to the buttery feeling of the leaves. Several species are cultivated for their dainty flowers, and as curiosities on account of their carnivorous habits, but they are rather difficult to manage unless conditions are naturally right. They are less popular in America as greenhouse plants than in Europe. Several species are natives of the United States.

BUTTERWORTH, Hezekiah, American story writer and poet: b. Warren, R. I., 22 Dec. 1839; d. there, 5 Sept. 1905. He was editor of the *Youth's Companion,* 1871–74. He published many popular juvenile stories and travels, including 'Zig-Zag Journeys' (1876–90); 'Songs of History: Poems and Ballads upon Important Episodes in American History' (1887); 'The Wampum Belt, or the Fairest Page of History' (1896); 'A Knight of Liberty'; 'The Patriot Schoolmaster'; 'Poems for Christmas, Easter, and New Year'; 'The Boyhood of Lincoln'; 'Boys of Greenway Court'; 'In Old New England'; 'Traveler Tales of China'; 'Over the Andes'; 'Great Composers'; 'South America'; and many others.

BUTTMANN, Philipp Karl, German scholar: b. Frankfort-on-Main 1764; d. Berlin, 21 June 1829. He was educated at the University of Göttingen and in 1789 was made assistant at the Berlin Royal Library, later becoming secretary and librarian. From 1796 to 1808 he also held a chair in the Joachimsthal Gymnasium at Berlin and on the establishment of the University of Berlin he was appointed a professor there. He published 'Griechische Grammatik' (1792; 22d ed., 1869); Griechische Schulgrammatik' (14th ed., 1862); 'Texilogus' (1818; 2d ed., 1860); a glossary of difficult Homeric words; ‹Ausführliche griechische Sprachlehre› (1827); ‹Mythologus› (1828); a continuation of Spalding's edition of Quintilian, and editions of various Greek classics.

BUTTON, Sir Thomas, English navigator in the early part of the 17th century, the successor of Hudson in exploring the northeastern coast of North America. He sailed in 1612 with two vessels, the *Resolution* and the *Discovery*, passed through Hudson Strait, and was the first to reach land on the western coast of the bay. The point which he touched was in lat. 62°, and was named by him Carey's Swan's Nest. Being obliged to winter in this region, he selected a position near the mouth of a river, first named by him Nelson's, after the master of his ship. Every precaution was taken against cold and icebergs, yet the severity of the climate occasioned much suffering to his crew, and was fatal to a few of them. During the next summer he explored and named several places on the coast of Hudson Bay, and advancing to lat. 65°, became convinced of the possibility of the Northwest Passage.

BUTTON, a small circular disc or knob of mother of pearl, horn, metal or other material, with a shank or perforations through its centre for attachment to an object, and made to fit into a hole formed in another one for its reception, the two fastening the objects together. Its chief use is to unite portions of a dress together. The ancient method of fastening dresses was by means of pins, brooches, buckles and tie-strings. Buttons of brass are found on dresses of the 16th century. Gilt buttons were first made in 1768 and those of papier-mâché in 1778. Buttons of vegetable ivory are now all but universally used for tweed coats and vests. The palm fruit which yields it is called corozo nut. It is not unlike true ivory but softer, and is easily turned and dyed. These buttons are often mottled with some stain to suit the common patterns of tweed stuffs. Recently a substitute vegetable ivory has been found in the seeds of a common palm of northern Africa (*Hyphenæ thebacia*). These seeds are known to the trade as gingerbread doum, doom or dum nuts. They are much cheaper than the tagua, corozo or South American ivory nuts, and are available in much larger quantities. The difficulty at present is the adaptation of existing machinery to the manufacture of buttons from this African nut, but it is believed that within a short time manufacturers will see the advisability of installing machinery especially designed to make buttons, trinkets and toys in the most efficient manner from this new and less expensive material. Mother of pearl buttons are formed of the beautiful substance of which the large flat shell of the pearl oyster consists, and this has long been a favorite material for buttons. Small cylinders are first cut out of the shells with a tubular saw. These are then split into discs, which are shaped by a steel tool, drilled with holes, and finally polished with rotten stone and soft soap, or by a more recent method with ground charcoal and turpentine. Shirt studs as well as flat and globular buttons with metal shanks are also made of this substance.

Among other animal substances used for buttons are ivory, bone, horn, and hoof. From this last so-called horn buttons were some years ago made in enormous numbers by pressing them in heated dies in which the design was cut. There are many kinds of composition buttons. Glass buttons are made in great variety. For pinched buttons small rods of colored glass are heated at the ends, and pressed into shape by means of a pair of rather long hand pliers, on the ends of which are a die and its counterpart, likewise kept hot. Other kinds are cut out of colored sheet glass, which is coated on the back with tin amalgam like a mirror. With other varieties, some beautiful glass buttons are made in Bohemia, either partly or wholly of aventurine glass; and of this gold-spangled material artistically inwrought with other colors, studs and solitaires still more remarkable for their beauty and minute patterns are made at Venice. Porcelain buttons were a few years ago nearly all of French manufacture, but are now made principally at Prague. The plastic clay is pressed into molds of plaster of Paris in the same way as small objects are usually produced in earthenware. Some are plain and others are painted or printed with patterns. More or less expensive buttons are made of ornamental stone, such as agate, jasper and marble. Occasionally they are formed of amber, jade or of still more costly materials, as pearls and gems. In recent years, improved methods and machines have been introduced for the shaping as well as for the polishing and finishing of bone, corozo and wood buttons. In England, Birmingham is the seat of the button trade, which, however, is much more largely developed in France. Brass buttons were made in Philadelphia in 1750, and hard-wood buttons were made there soon after. The button factory in Waterbury, Conn., now the seat of the metal button manufacture, was established about 1800. Horn buttons were made in the United States as early as 1812, and the production of buttons covered by machinery was begun at Easthampton, Mass., by Samuel Williston in 1827. The making of composition buttons was begun at Newark, N. J., in 1862, and there have been about 1,500 patents for buttons issued by the patent office of the United States. In 1850 there were in the United States 59 establishments for the manufacture of buttons, with an output whose value was placed at $964,359. According to the returns of the United States census of manufactures for 1914 the button industry comprised 517 establishments, producing in that year 60,602,359 gross of buttons valued at $16,233,198.

The most important branch of the button industry was the manufacture of pearl buttons, either from mother of pearl or ocean pearl or from the shells of the Unios or fresh-water pearl.

In 1914 there were manufactured 26,181,405 gross of pearl buttons, with a value of $7,369,208, representing 43.2 per cent of the total quantity and 45.4 per cent of the total value. Of this amount, 21,664,436 gross, valued at $4,879,844, were made from fresh-water pearl and 4,516,969 gross, valued at $2,489,364, from mother of pearl or ocean pearl.

Next in importance was the manufacture of buttons from vegetable ivory, the output of this kind amounting to 5,128,005 gross, valued at $2,885,503, or 8.5 and 17.8 per cent of the total in quantity and value, respectively.

The others of the more important classes in point of value were covered buttons, $1,600,178; celluloid, $724,354; shoe, $610,796; bone, $329,934; horn, $299,487; and ivory, $283,484. In addition various other kinds and parts, having a total value of $2,130,254, were manufactured.

Of the 517 factories reporting in 1914, there were 224 located in New York, 81 in Iowa, 60 in New Jersey, 31 in Illinois, 21 in Pennsylvania, 18 in Connecticut, 14 in Massachusetts, 12 in Indiana, 9 each in California, Missouri and Ohio, 5 in Arkansas, 4 in Kentucky, 3 each in Minnesota and Washington, 2 each in Michigan, Rhode Island, Tennessee, West Virginia and Wisconsin, and 1 each in Colorado, Kansas, New Hampshire and Oregon.

Statistics compiled in July 1916 by the Bureau of Foreign and Domestic Commerce showed that American export trade in buttons indicated an increase of 79 per cent and prospects of further advancement. This was owing to the fact that the normal European production of buttons, the largest in the world, was curtailed by the war. Under usual conditions the United States manufactures enough to meet about nine-tenths of its own requirements and more than half the supply of Canada, which has some factories of its own, and ranks next to the European nations in production. The American export trade in buttons amounting to $654,372 in 1914, more than half of which was with Canada, expanded to $1,171,232 in 1915, with England, Canada, Australia and Cuba the largest purchasers. The bibliography of the button industry is varied and interesting: Consult 'The Button Industry in Europe'— *Consular Reports* Vol. 58, pp. 481–91 (Washington, D. C., 1898); 'The Emilio Collection of Military Buttons, American, British, French and Spanish, with some other countries' (Essex Institute, Salem, Mass., 1911); Rathbone, R. L. B., 'Buttons,' *Art Journal,* Vol. 71, pp. 7–14 (London 1909); Smith, H. W., 'The Pearl-Button Industry of the Mississippi River,' *Scientific American,* Vol. 81, pp. 86–87 (New York 1899); Petrie, W. F., 'Buttons from Egypt,' *Antiquary,* Vol. 32, pp. 134–37 (London 1896); Skeel, R., Jr., 'Covered and Celluloid Button Factories in New York City,' New York Commission Report (Albany 1915); 'Art in Buttons'— German-American Button Company (Rochester 1906–16).

BUTTON-BUSH, HONEY-BALL, or **GLOBE-FLOWER,** a North American shrub (*Cephalanthus occidentalis*) of the madder family, which grows in wet places, and bears extremely fragrant flowers whose small florets are folded or packed into balls, while «the long styles and capitate stigmas remind us of pins stuck in a cushion.»

BUTTON-QUAIL, a small quail-like bird of the genus *Turnix,* family *Turnicidæ,* order *Hemipodii,* of which there are some 20 species in various parts of the Old World, some of which are termed bustard-quail, bush-quail, ortygan and hemipode. They frequent wooded places and afford good sport for the gunner. The females, as well as the males, are brightly colored. They are one of the smallest game birds known, inhabit woody places and feed generally on berries and insects.

BUTTONWOOD, a name often given to the North American plane (*Platanus occidentalis*). See PLANE.

BUTTRESS, in architecture, a structure of masonry used to resist the thrust of an arch or vault. It takes the form of a great proportionate thickening of the walls at the point where the thrust affects the wall, the thickness sometimes increasing until the mass of masonry is set across the general direction of the wall. Thus in the developed Gothic style it nearly replaces the wall, because all the space between buttress and buttress is occupied by a great window. In the case of an archway in a single wall it often happens that the two sides or outer edges of the wall are carried up in such a way that they are spread wider toward the base and approach one another at the top, by means of certain offsets or steps, and these extensions of the wall are called buttresses, although they are mere widenings of the wall. In like manner some English Gothic church towers have curious diagonal spurs projecting on the four corners, in the form of short pieces of wall built on a prolongation of a diagonal of the square plan, and these are considered as buttresses, although they have very rarely any thrust to resist, because the tower is not often occupied by vaulted chambers, and because the meeting of the two walls would provide sufficient masonry for the practical purpose. It is a vice in that style that these considerations are lost sight of.

Historically, the real buttress begins to show itself in Romanesque work along the walls of the aisles, and is at first a slight projecting pilaster-like thickening of the wall, or a rounded projection like an engaged shaft of a column. These are called by special names, as buttress-pier, pilaster-strip, etc. They were very inadequate for their purpose (see ROMANESQUE ARCHITECTURE) and their presence shows the uneasiness of the early builders in trying to dispense with the precautions taken by their masters, the Romans of the empire, and their hesitation in building what alone would do the work. As the vaulting within became concentrated on certain points, when groined vaults superseded barrel-vaults for the aisles, the need of the buttress became more evident, and in some Romanesque churches they have been built up afterward, the walls being stayed up with great cost and trouble after they had begun to spread under the thrust of the vault. It was not until the ribbed vault came in and the Gothic style came into being that the buttress took its permanent shape of a piece of wall, thin in comparison to projection; that is to say, having by far its greatest dimension in the direction of the thrust of the vault and therefore at right angles with the wall of the church. Except in modern Gothic exterior buttressing is seldom employed nowadays. It is, however, employed in railway stations and factories, where strong vibration of the floors necessitates the reinforcement of the walls at regular intervals. See FLYING BUTTRESS.

BUTTZ, Henry Anson, American educator: b. Middle Smithfield, Pa., 18 April 1835. He was graduated at Princeton in 1858, and entered the Methodist ministry the same year. He was president of Drew Theological Seminary, 1880–1912, president emeritus since 1912, and has written much on polemics, exegetics and hermeneutics.

BUTYRIC ACID, an acid obtained from butter; it also occurs in perspiration, in cod liver oil and other fats, and in meat juice. When obtained, as it may be from butter and from sugar, it is in the form of a clear, oily, volatile fluid. It combines with bases, and forms crystalline salts, which possess no taste. Butyric acid is a colorless liquid, having a smell like that of rancid butter; its taste is acrid and biting, with a sweetish after-flavor. Formula, normal butyric acid $CH_3.CH_2.CH_2.COOH$.

BUTYROSPERMUM, a genus of tropical trees found in the East Indies and Africa, of the family *Sapotaceæ*. One species (*B. parkii*) is supposed to be the shea-tree of Park, the fruit of which yields a kind of butter that is highly valued and forms an important article of commerce in the interior of Africa. There are several other species, of which *B. longifolium*, or Indian oil-tree, and *B. butyraceum*, or Indian butter-tree, are well-known examples, yielding a large quantity of oleaginous or butyraceous matter. The wood is as hard and incorruptible as teak. See also BUTTER-TREE.

BUXAR, buks'är, or **BAXAR,** a town of British India, in the district of Shahabad, presidency of Bengal, situated on the south bank of the Ganges, about 60 miles below Benares. It is celebrated for a victory which confirmed the British in the possession of Bengal and Bahar, 23 Oct. 1764.

BUXTEHUDE, bŭks-tĕ-hoo'de, **Dietrich,** German organist: b. Helsingör 1637; d. 9 May 1707. His father was organist at Helsingör for 32 years, and no doubt imparted the art to his son. In 1668 Buxtehude was appointed to the important post of organist at the Marienkirche (Mary's Church) in Lübeck. In 1673 he introduced special church concerts after the evening services on the five Sundays before Christmas. He wrote the music for these concerts, producing new compositions with much rapidity. The great Bach tramped a long distance in 1705 to hear Buxtehude play and to learn from him.

BUXTON, Sidney Charles, 1st Viscount of Newtimber (cr. 1914), G.C.M.G., LL.D., 1916; high commissioner and governor-general of South Africa since 1914: b. October 1853. He was educated at Clifton College and Trinity College, Cambridge; was member of the London school board from 1876 to 1882; of the Conciliation Committee of the Dock Strike, 1889; of the Royal Commission on Education, 1886–89; of the Income Tax Committee, 1904; Under-Secretary for the colonies, 1892–95; M.P. for Petersborough, 1883; and from 1905–10 he was Postmaster-General. While in this latter office he succeeded in introducing penny postage to the United States and reduced magazine postage to Canada. The Insurance Act and the Copyright Act, both passed in 1911, were largely his work, as were the Bankruptcy Act and Extension of Trade Boards Act, 1913, and the Pilotage Act of 1912. He was M.P. for Popular, 1886–1914. His published works include 'Handbook to Political Questions' (11th ed.); 'Political Manual' (5th ed.); 'Finance and Politics' (1783–1885); 'Handbook to Death Duties'; 'Mr. Gladstone as Chancellor of the Exchequer'; 'The Fiscal Question'; 'Fishing and Shooting'; 'Recreations.'

BUXTON, SIR Thomas Fowell, English philanthropist: b. Earl's Colne, Essex, 1 April 1786; d. 19 Feb. 1845. He was educated at Trinity College, Dublin, and in 1808 joined the firm of celebrated brewers, Truman, Hanbury & Company, and took an active share in carrying on the business. In 1816, on the occasion of the Spitalfields distress, he made his first public effort in a speech at the Mansion House, and afterward succeeded in organizing an extensive system of relief. He next proceeded, in concert with his sister-in-law, the celebrated Mrs. Elizabeth Fry (q.v.), to examine into the state of prisons; and as the result of his inquiries produced in 1818 a work entitled 'An Inquiry Whether Crime and Misery are Produced or Prevented by Our Present System of Prison Discipline,' which attracted great attention, and led to the formation of the Prison Discipline Society. In 1818 he was elected member of Parliament for Weymouth, and continued to sit for it in successive Parliaments till 1837. He distinguished himself by his enlightened zeal in the cause of humanity, and was long the right-hand man of Wilberforce, who, on retiring from public life, selected Buxton as the person best qualified to carry out those of his benevolent schemes which remained uncompleted. In 1823 he moved and, with a slight modification, carried a resolution to the effect that slavery, being repugnant to the Christian religion and the British constitution, ought to be abolished. Subsequently in 1831 he made such an impression on the House and country by an admirable speech that the government were glad to take the matter into their own hands and give full effect to emancipation. After his retirement from Parliament the slave trade occupied much of his thoughts, and he published in 1839 a work entitled 'The Slave-trade and Its Remedy.' In 1840 he was created a baronet. Consult 'Memoirs of Sir T. F. Buxton, Bart.' (1872).

BUXTON, England, a town in Derbyshire, 36 miles northwest of Derby, and 25 south-southeast of Manchester. The highest town in England and the centre of the Peak District. Buxton has long been famous for its calcareous springs, the waters being taken for indigestion, gout, rheumatism and nervous and cutaneous diseases. The locality was known to the Romans, who had baths here. The season extends from May to October. The town is 1,025 feet above sea-level and is situated in a deep valley. Much of the splendor of Buxton is due to the Dukes of Devonshire, one of whom, in 1780, at the cost of $600,000, erected an immense three-storied pile of buildings, called the Crescent. Near Buxton is the Diamond Hill, famous for its crystals; and Poole's Hole, a gas-lit stalactite cavern 770 yards long. Mary, Queen of Scots made several visits to the baths at Buxton while a prisoner in the custody of the Earl of Shrewsbury. Pop. (1911) 10,024.

BUXTORF, Johann (THE ELDER), German Orientalist: b. Kamen, Westphalia, 25 Dec. 1564; d. Basel, 13 Sept. 1629. He spent his student years at Marburg, Herborn, Heidelberg, Basel, Zürich and Geneva. Being very learned in Hebrew and Chaldaic, in the acquirement of which he obtained the assistance of many learned Jews, he was engaged by the magistrates of Basel to become professor of those languages, which he taught with great success. His chief works are ‘Lexicon Chaldaicum, Talmudicum et Rabbinicum’ (1639); ‘Thesaurus Linguæ Hebraicæ’; ‘Biblica Hebraica Rabbinica’; ‘Synagoga Judaica hoc est Schola Judæorum’ (1604); ‘Institutio Epistolaris Hebraica’; ‘Concordantiæ Bibliorum Hebraicorum.’ Consult Kautsch, ‘Johann Buxtorf der Ältere’ (Tübingen 1880).

BUXTORF, Johann (The Younger), German Hebraist: b. Basel, 13 Aug. 1599; d. there, 16 Aug. 1664; son of the preceding. He entered the University of Basel at 12, became master of arts at 16, and proceeded to Heidelberg and afterward to Geneva. In 1629 he succeeded his father in the chair of Hebrew at Basel, and occupied it for 34 years, until his death. The same chair was filled by his son and his nephew successively during 68 years longer, making a combined occupancy of this professional chair by the Buxtorf family for an unbroken period of 140 years. He spent a great part of his life in controversy with other scholars regarding disputed biblical and theological questions, and especially regarding the antiquity of the vowel system in Hebrew. He completed and published two of his father's principal works, the ‘Lexicon Chaldaicum, Talmudicum, et Rabbinicum’ (Basel 1639) and ‘Concordantiæ Bibliorum Hebraicorum’ (Basel 1632), the most important publication of his own being the ‘Lexicon Chaldaicum et Syriacum’ (Basel 1622).

BUXUS, the genus name of a number of shrubs or small trees. See Box.

BUYS-BALLOT, bu-is-bạ-lō, **Christophorus Henricus Didericus**, Dutch meteorologist: b. Kloetinge, Zeeland, 10 Oct. 1817; d. Utrecht, 2 Feb. 1890. He studied at the University of Utrecht, where he became professor of mathematics in 1847, and professor of experimental physics in 1870. In 1854 he received the appointment of director of the Royal Meteorological Institute at Utrecht. He was one of the initiators of the new system, under which, by daily synoptical weather reports, and simultaneous observations by land and sea, materials are collected for forecasting changes. His own observations have resulted in the determination of a general law of storms, known as the Buys-Ballot law. The inventor of a system of weather signals, he was largely instrumental in bringing about an international uniformity in meteorological observations. His works include ‘Changements périodiques de la température’ (1847); ‘Eenige reglen voor te wachten van weerverandering in Nederland 1860’; in English, ‘Suggestions on a Uniform System of Meteorological Observations’ (1872–73); and 40 volumes of the *Annual* of the Meteorological Institute.

BUYUKDEREH, bĭ-yook'dė-rā, a little town on the western side of the Bosporus 10 miles north-northeast of Constantinople, situated in the midst of a large, deep-bosomed valley. It is the summer residence of the European embassies at Constantinople, and its gardens and palaces, not less than its natural beauty and coolness, make it a favorite promenade ground. The tradition that Godfrey of Bouillon encamped here with his army is not alluded to in the original records of the Crusades.

BUZFUZ, Sargeant, a character introduced by Dickens in the ‘Pickwick Papers.’ He is the barrister who becomes counsel for the plaintiff in Mrs. Bardell's breach of promise suit against Mr. Pickwick, and is remarkable for the ingenuity he displays in drawing incriminating inferences from ordinary and inconsequential occurrences.

BUZZARD, a term given in America to two distinct groups of birds — buzzard-hawks of the genus *Buteo* and its allies, also familiar to Europeans, and the turkey-buzzard — a vulture. The buzzard-hawks are closely related to the eagles, from which they are distinguished by the smaller size in the majority of cases, the smaller and rounder head and a slow and heavy manner of flight. They feed chiefly upon the smaller mammals and reptiles, seldom catching or disturbing poultry, although popularly accused of it and styled “hen-hawks.” Important North American species of the genus *Buteo* are the red-tailed, red-shouldered, Swainson's, and broad-winged hawks, all of which are elsewhere described under their names. The most important of the genus *Archibuteo* is the rough-legged hawk (q.v.), and the handsomest one, the squirrel hawk of California. In the southern United States the name usually refers to the common black vulture (*Cathartes aura*). See Turkey-Buzzard.

BUZZARD'S BAY, on the southeast coast of Massachusetts, is about 30 miles long, and has a mean breadth of seven miles. It is sheltered from the ocean and separated from Vineyard Sound by the Elizabeth Islands. Its chief harbors are those of New Bedford, Wareham, Mattapoisett, Nasketucket and Sippican.

BUZZING, the sounds produced by many insects, other than by mechanical means, that is, by friction. How the buzzing of bees, flies, etc., is produced has been a disputed question. Two distinct sounds may be distinguished — one, a deep noise, is due to the vibration of the wings, and is produced whenever a certain rapidity is attained; the other is an acute sound, and is said to be produced by the vibrations of the walls of the thorax, to which muscles are attached; this sound is specially evident in *Diptera* and *Hymenoptera*, because the integument is of the right consistence for vibration. In both of these, observers agree that the spiracles are not concerned in the matter. Laudois tells us that the wing-tone of the honey bee is A′; its voice, however, is an octave higher, and often goes to B″ and C″. The sounds produced by the wings are constant in each species, except where, as in *Bombus*, there are individuals of different sizes; in these the larger ones generally give a higher note. Thus, the comparatively small male of *B. terrestris* hums on A′, while the large female hums an entire octave higher. Consult Sharp, ‘Insects’ (New York 1899); Packard, ‘Textbook of Entomology’ (New York 1898).

BYBLOS, bĭb'lŏs, an ancient maritime city of Phœnicia, more properly Gyblos, now called Jebail, a little north of Beyrout. It is often mentioned in inscriptions under the form G B L and it also appears in cuneiform documents as early as the 15th century B.C. either as Gubli or Gubal. It was the chief seat of the worship of Adonis of Thammuz, and of Astarte as Baalat-Gublu. In Ezek. xxvii, 9 the town is called Gebal. To Strabo and the Greek authors it was always Byblos. Philo Byblius was born there. There are extensive remains dating from the Roman period and from the times of the Crusades.

BYERLY, William Elwood, American mathematician: b. Philadelphia, 13 Dec. 1849. He was graduated at Harvard College in 1871; was assistant professor of mathematics at Cornell University from 1873–76 and at Harvard from 1876–81, when he became professor. He became professor emeritus in 1913. He is a fellow of the American Academy of Arts and Sciences. Among his works are ‹Elements of Differential Calculus› (1879); ‹Elements of Integral Calculus› (1881); ‹Problems in Differential Calculus› (1895), and a ‹Treatise on Fourier's Series and Spherical, Cylindrical and Ellipsoidal Harmonics› (1893).

BYERS, Samuel Hawkins Marshall, American writer: b. Pulaski, Pa., 23 July 1838. Educated at public schools in Iowa. He served four years in Union army; was captured at battle of Chattanooga. While in prison at Columbia, S. C., he wrote ‹Sherman's March to the Sea,› a song that gave its name to the great campaign, and of which 1,000,000 copies were sold. In 1865 he escaped from prison, rejoined the army and served on General Sherman's staff in the Carolinas; was sent down to Cape Fear River and brought the first news north of Sherman's success. After the war he was appointed consul to Switzerland 1869–84; promoted consul-general to Rome in 1884. Later, he was consul-general to Switzerland under President Harrison. Altogether he was some 20 years in the foreign service. He wrote ‹Switzerland and the Swiss› during this time, and published a volume of poems, ‹The Happy Isles.› On leaving the service he published ‹Iowa in War Times›; ‹The March to the Sea, or the story of the Great Campaign,› in verse; ‹The Honeymoon,› a volume of verse; ‹With Fire and Sword,› a prose account of his adventures in the Civil War; ‹A Layman's Life of Jesus›; ‹Twenty Years in Europe, or the Life of a Consul-General› (1896), which contained 50 personal letters to the author from General Sherman; ‹Complete Poems› (1914); ‹The Bells of Capistrano› (1915), a love poem of the old mission days in California; also ‹Glorietta, or The City of Fair Dreams› (1916), a poetical romance of Monterey, Cal., in the Spanish days.

BYERS, William Newton, pioneer, journalist, publicist and capitalist: b. Madison County, Ohio, 22 Feb. 1831; d. 1901. As a civil engineer he served in the capacity of United States deputy surveyor in Iowa, Oregon, Washington, Nebraska and Colorado. He was a member of the first Nebraska State legislature and of the first Colorado constitutional convention. In 1864–66 and from 1879–83 he was postmaster of Denver. In 1859 he founded the *Rocky Mountain News,* of which he was editor and publisher for 20 years. A man of modest and retiring disposition, he was one of the most constructive personalities in the history of Colorado.

BYESVILLE, Ohio, a village of Guernsey County on the Pennsylvania Railroad, 95 miles east of Columbus. It is the commercial centre of a large bituminous coal mining region, and has manufactures of bricks, tiles, glass and gas engines. Pop. 3,156.

BYINGTON, Cyrus, missionary among the Indian: b. at Stockbridge, Mass., 11 March 1793; d. Belpré, Ohio, 31 Dec. 1868. His early educational advantages were limited, but in his youth he was taken into the home of Joseph Woodbridge in his native town, under whose tuition he studied Latin and Greek and with whom he afterward read law. He was admitted to the bar in 1814 and began to practice, but soon after entered the theological seminary at Andover, Mass., at which he graduated in 1819. Having been ordained to the ministry, he entered the service of the American Board of Commissioners for Foreign Missions (Congregational) and was assigned labor among the Choctaw Indians in Mississippi. Journeying overland from Massachusetts to Pittsburgh, he descended the Ohio and Mississippi rivers in a flatboat to the point nearest his destination. After working among the Choctaw people in Mississippi for a dozen years, he accompanied them on their westward migration to the Indian Territory, opening up and building a new mission station near Eagletown, in the southeastern part of the Choctaw Nation, which he named in honor of his native town — Stockbridge. His health failing, in 1851, he went to New York, but later returned and resumed his work among the Choctaw people, which he continued until the outbreak of the Civil War put an end to all missionary enterprises in that section. Early in his missionary career he began to make an exhaustive study of the Choctaw language, a grammar of which was completed in 1834. He also compiled a Choctaw-English dictionary, upon the seventh revision of which he was engaged at the time of his death, nearly half a century after the beginning of his missionary labors. This work, entitled «A Dictionary of the Choctaw Language,» was issued as Bulletin 46, of the Bureau of American Ethnology, in 1915.

BYLAW, a particular or private law, as the local or subordinate law of a city, town, private corporation or other organization. The power to make bylaws is usually conferred by express terms of the charter creating the corporation; though, when not expressly granted, it is given by implication, and it is incidental to the very existence of a corporation. The constitution of the United States and acts of Congress made in conformity to it, the constitution of the State in which a corporation is located, and all acts of the legislature constitutionally made, together with the common law as there accepted, are of superior force to any bylaw; and any bylaw, when contrary to either of them, is void, whether the charter authorizes the making of such bylaw or not; because no legislature can grant power larger than it possesses. A valid bylaw of a municipality is a true law, for it has the authority of the State behind it. Bylaws of corporations and societies are rather working agreements between the members than laws in the true sense. Consult Boisot, ‹By-Laws of Private

Corporations' (2d ed., Saint Paul 1902), and Pollock and Maitland, 'History of English Law' (2d ed., Boston 1899).

BYLES, Mather, American clergyman: b. Boston, 26 March 1706; d. there, 5 July 1788. He was graduated at Harvard in 1725; was ordained to the ministry in 1733 and was placed over the church in Hollis street, in Boston, in the year 1733, and obtained a distinguished position among the contemporary clergy. He was learned after the manner of those times, and was more addicted to literary recreations, and had a keener relish of the later humanities than was then common among the members of his profession. As a proof of his recognized excellence in polite letters, we may accept the fact that he was the correspondent of some of the chief poets and authors of England. He was himself a votary of the muses in a small way, and a volume of his miscellaneous poems was published in 1744. He gave an early expression, too, to the loyalty which distinguished his character through life, in a poem on the death of George I and the succession of his son, in 1727, when he was but 21 years of age. He also tempered the bereavement which Governor Belcher had suffered in the loss of his wife in 1734, by such consolation as an elegiac epistle could convey. It is not likely, however, that his name would have been preserved to this time had his reputation depended on the merits of his poetical effusions. The cheerful flow of his spirits and frank gaiety of his conversation seem to have been something out of the common way, and to have left an enduring mark on the memories of that generation. His piety was tinctured with no asceticism, and the lively sallies of his sprightly imagination, always kept within the limits of decorum, were restrained by no fear of injuring his personal or clerical dignity. He was an ardent Royalist and in 1777 was sentenced to banishment, but was allowed to remain under guard in his own house. This severity was soon relaxed for a while, and afterward renewed. One of the stories told of him is, that wishing to have an errand done at a distance, he asked the sentry to undertake it. The man objected on the ground that he could not leave the door unguarded; on which the doctor volunteered to be his substitute, and, accordingly, was seen by some one in authority, in powdered wig and cocked hat, with a musket on his shoulder, walking up and down before his house, keeping guard over himself. His release from custody soon followed, on which occasion, alluding to these changes of treatment, he said that he had been «guarded, regarded and disregarded.» His son, Mather, b. 1736; d. 1814, was also a clergyman and became the rector of the Tories, who, expelled from Boston, founded Saint John, New Brunswick.

BYLLYNGE, bĭl-lĭng, **Edward,** English provincial governor: d. 1687. He became joint purchaser with John Fenwick of a large tract of land in what is now the State of New Jersey. Upon the occasion of a dispute between the two proprietors, nine-tenths remained, by Penn's decision, with Byllynge and was long known as «the Byllynge Tenths.» He was governor of the province of West Jersey in 1677. Consult Taimer, 'The Province of New Jersey, 1664–1738' (New York 1908); Myers, 'Narratives of Early Pennsylvania, West New Jersey and Delaware, 1630–1707' (New York 1912).

BYNG, George Viscount Torrington, English admiral: b. Wrotham, Kent, 27 Jan. 1663; d. 17 Jan. 1733. He entered the navy at the age of 15. In 1688 he recommended himself to William of Orange, and for his gallant conduct at the sea-fight of Malaga was knighted by Queen Anne. In 1706 he was elected to Parliament from Plymouth. Two years later he commanded a squadron sent out to oppose the Pretender's invasion. He followed the French fleet and forced it to take refuge at Dunkirk. In 1718 he commanded the English fleet sent to Sicily for the protection of the neutrality of Italy, and on 31 July utterly destroyed the Spanish fleet off Messina. Later he became naval treasurer and attained the rank of rear-admiral. In 1715 he was created Knight of the Bath and was First Lord of the Admiralty after the accession of George II in 1727. He was created Viscount Torrington in 1721.

BYNG, John, English admiral: b. 1704; d. 14 March 1757. He was the son of Viscount Torrington, and by his own merits, as well as the influence of his name, was raised to the rank of admiral. His attempts to relieve Fort Saint Philip, in Minorca, when blockaded by a French fleet under La Galissonière, proved abortive, and his hesitation in engaging the enemy, when a bold attack might have perhaps gained him the victory, excited the clamor of the nation against him. The ministry, who wished to avert the public odium from their unsuccessful measures, beheld with seeming satisfaction the unpopularity of Byng, and when he was condemned by a court-martial they suffered him, though recommended to mercy, to be sacrificed to the general indignation, and he was shot at Portsmouth. The historical controversy as to his guilt is still undecided.

BYNG, Sir **Julian Hedworth George,** K.C.B., K.C.M.A., M.V.O., English soldier, the 7th son of the 2d Earl of Stafford: b. 11 Sept. 1862. He passed through the Staff College and became lieutenant in the 10th Royal Hussars in 1883. He saw his first service in the Sudan campaign 1884, was present at El Teb and Tamai, and received the Khedive's Star for gallant conduct. He rose to captain in 1890, major in 1898, served through the South African War 1899–1902, during which he commanded the South African Light Horse and several flying columns in various parts of Cape Colony and Orange Free State. He was «mentioned in despatches» five times, received the Queen's and King's medals with six clasps and was brevetted colonel in 1902. For the next two years he commanded his old regiment; was in charge of the Cavalry School at Netheravon 1904–05; commanded the 2d Cavalry Brigade 1905–07; the 1st Cavalry Brigade in 1909; promoted major-general in that year and placed in command of the East Anglian Division, 1910–12. In the latter year he was appointed commander-in-chief of the Egyptian army under the administration of Lord Kitchener, who undoubtedly influenced the appointment. At the outbreak of the European War he was recalled from Egypt and given the command of the 3d Cavalry Division, which was attached to the 7th Division of the 4th Army Corps. The

Byng family history now repeated itself. General Byng's grandfather, General Sir John Byng, 1st Earl of Strafford, had served as a youth in the disastrous campaigns in Flanders under Colonel Wellesley (afterward Duke of Wellington) in 1793–95. Over 120 years later Sir Julian Byng stood on the same battlefields, but at the side of his grandfather's enemies, the French. The troops under his command covered the Belgian retreat, checked the German onslaught at the first battle of Ypres, and "were repeatedly called upon to restore the situation at critical points, and to fill gaps in the line caused by the tremendous losses which occurred" (Sir John French, 4th dispatch, 20 Nov. 1914). General Byng commanded the 9th Army Corps in the Gallipoli campaign of 1915, and at the end of May 1916 he succeeded Lieut.-Gen. Sir Edwin Alderson in the command of the Canadian corps on the western front. Under his lead the Canadian troops performed prodigies of valor in the great Somme battles (q.v.), and again in the dashing capture of the German stronghold, Vimy Ridge. In June 1917 General Byng was placed in command of the 3d Army in succession to General Allenby, and on 20 Nov. 1917 his army opened what has been described as the most dramatic episode on the western front since the battle of the Marne, namely, the great drive on Cambrai (q.v.). Before the enemy realized what had happened, the so-called impregnable "Hindenburg Line" had been shattered and thousands of prisoners captured. The distinguishing feature of this brilliant exploit was the utter absence of the customary "artillery preparation." Accompanied by the formidable "tanks," the British infantry advanced at dawn and stormed the enemy's trenches with remarkably few losses. See War, European, Western Front.

BYNKERSHOEK, bĭn'kėrs-hook, **Cornelius van**, Dutch jurist: b. Middleburg, Zealand, 29 May 1673; d. 16 April 1743. He studied at the University of Franeker, and after practising as a barrister at The Hague, became professor of law at Leyden, and president of the supreme council of Holland. He was one of the most learned among modern civilians. His books are in Latin, and his treatise 'De Foro Legatorum Competente' was translated by Barbeyrac into French under the title of 'Du Juge Compétent des Ambassadeurs' (1728). His most important writings are the 'Observationes Juris Romani'; 'De Dominio Maris'; 'Quæstiones Juris Publici'; and a digest entitled 'Corpus Juris Hollandici et Zelandici.' A complete edition of his works was published at Geneva in 1761, and at Leyden in 1766.

BYR, bŭr, **Robert**, pseudonym of Karl Robert Emmerich Bayer (q.v.).

BYRD, bėrd, **William**, American lawyer and author: b. Westover, Va., 1674; d. there, 26 Aug. 1744. He received a liberal education in England, possessed one of the largest libraries in the colonies, and, having a large property, lived in a splendid style, unrivaled in Virginia. He was a member and a last president of the King's Council. To French Protestants fleeing to Virginia from persecution in France, he extended the most generous assistance. The towns of Richmond and Petersburg were laid out by him, and he was one of the commissioners for establishing the boundary line between Virginia and North Carolina. He was a member of the Royal Society, and as a patron of literature and art deserves remembrance. His own writings include the 'Westover Manuscripts,' embracing 'The History of the Dividing Line'; 'A Journey to the Land of Eden'; and 'A Progress to the Mines.' In *The Virginian Magazine of History and Biography* (1902) appeared his letters, revealing much of interest concerning his personality and career. Consult Trent, 'English Culture in Virginia' (1889); 'A History of American Literature' (New York 1903).

BYRD, William, composer. See Bird, William.

BYRGIUS, bėr'jĭ-ŭs, **Justus** (properly Jobst Bürgi), Swiss mathematician: b. Lichtensteig, Canton of Saint Gall, Switzerland, 28 Feb. 1552; d. Cassel, Germany, 31 Jan. 1632. He was invited to Cassel by the Landgrave of Hesse to superintend the observatory which he had there erected, and constructed a number of astronomical instruments, some curious clocks and other machines, including the proportional compasses. A discovery involving that of the logarithms, and another exhibiting an application of the pendulum to clocks, have been attributed to him. He is eulogized by Kepler for his talents, but censured for his indolence and undue reserve, which kept back his discoveries from the public. Consult Gieswald, 'Justus Byrg als Mathematiker' (Dantzig 1856).

BYRNE, Thomas Sebastian, American clergyman: b. Hamilton, Ohio, 29 July 1841. He was graduated from Saint Mary's College of the West in 1865. In youth he was an expert machinist, but deciding to enter the priesthood of the Roman Catholic Church, he went, after preparatory training, to the American College in Rome. In 1869 he was ordained in Cincinnati. He devoted himself to literature and teaching in Mount Saint Mary's Seminary; for a time had charge of the Cincinnati Cathedral and again became connected with the seminary, acting as rector until 1894. He wrote 'Man from a Catholic Point of View' (1903), which was read at the Parliament of Religions in Chicago. He has published many other religious works and pamphlets. In collaboration with the Rev. Dr. Pabisch, he translated Dr. Alzog's 'Church History' (3 vols., 1874–78).

BYRNES, Thomas, American detective and chief of police: b. New York city 1842; d. there 7 May 1910. In young life a gasfitter, he served in the Civil War with the Ellsworth Zouaves, in 1863 joined the police force of New York city, was promoted captain in 1870, inspector in 1880, superintendent in 1892 and chief of police in 1895. He early became famous for his detective work, and despite great corruption in the police department, maintained an unbesmirched reputation. The nature of his work is well brought out in two books, one by himself, 'Professional Criminals of America' (New York 1886), and in collaboration with Campbell, H. S. T., and Knox, T. W., 'Darkness and Daylight, or Lights and Shadows of New York Life' (Hartford 1899).

BYRON, George Gordon, 6th lord, English poet: b. London, 22 Jan. 1788; d. Missolonghi, Greece, 19 April 1824. He was the son of «Mad Jack Byron,» a good-looking, profligate soldier, who first married the divorced Marchioness of Carmarthen, and had by her a daughter Augusta, later Mrs. Leigh. Captain Byron became a widower in 1784 and, a little more than a year later, married a Scotch heiress, Catherine Gordon of Gight. Their only child, the poet, was born at No. 16 Holles street, Cavendish Square, and was lame from birth, owing to a defect in one of his ankles. The influences surrounding the child were deplorable. John Byron, to escape his creditors, had to flee to France, where he died in 1791. Mrs. Byron, with a much reduced income, resided in Aberdeen and proved to be a most indiscreet mother, now fondly petting her child, now reviling him. She was actually guilty of reproaching him for his lameness. The boy himself was capable of great affection for his nurse and for a cousin, Mary Duff, and his schoolmates seem to have regarded him as warm-hearted. His education was not neglected during his early years, but tutors and schools could not make up for his lack of training at home. He learned, however, to love nature amid the Scotch hills.

In 1794 the grandson of the then Lord Byron died, and the six-year-old boy became heir to the peerage, which he inherited in 1798. Then his mother obtained a pension and left Scotland, Byron being made a ward in chancery and Lord Carlisle being appointed his guardian, though his mother's lawyer, John Hanson, really looked after his welfare. A quack tortured his foot, and schoolmasters tried to make him studious, his main mental nutriment consisting, apparently, of the Bible and poetry. He wrote love verses to a young cousin, endured his mother's caprices and was doubtless glad to be entered at Harrow in 1801, where, however, he was at first discontented and not liked. He could not make a scholar of himself, though, as Mr. Coleridge has shown, his classical attainments have been much underrated; but he was a good declaimer and through his pluck in fighting and in athletics, despite his deformity, he became a leader in the school. He was romantically devoted to his friends, and once offered to take half the thrashing a bully was giving to the boy who later was known as Sir Robert Peel. Impulsiveness characterized both his insubordinate attitude toward the school authorities and his love affair with his cousin and senior, Mary Anne Chaworth, who soon married and left him disconsolate. His affection for her seems never to have been entirely effaced. Altogether, his childhood and youth were well adapted to produce a wayward man.

In October 1805 he went into residence as a nobleman at Trinity College, Cambridge. He took full advantage of his privileges, ran into debt, though he had an allowance of £500 a year, gambled, consorted with pugilists, won fame as a swimmer, traveled about in style, and, last, but not least, after stormy quarrels with his mother, successfully asserted his claim to be his own master. He formed some warm friendships with promising students, notably with John Cam Hobhouse, afterward Lord Broughton (q.v.); he dabbled in literature and wrote verses, and he received his M.A. «by special privilege as a peer,» in July 1808. Nearly two years previously he had printed 'Fugitive Pieces,' a volume of poetry, but had destroyed all save two or three copies because a clergyman friend had objected to one poem as too free. A small edition of what was practically the same book, 'Poems on Various Occasions,' appeared early in 1807. A few months later this was reissued with considerable alterations as 'Hours of Idleness,' which was again altered in a second edition of March 1808, two months after the now famous slashing review from the pen of Brougham had appeared in the *Edinburgh Review*.

Byron's youthful volume certainly gave little indication of the genius he was soon to display, but it called for no severe chastisement. Hence, the editor of the *Edinburgh*, Jeffrey, got only what he deserved when Byron pilloried him in 'English Bards and Scotch Reviewers,' which appeared anonymously about the middle of March 1809, and was at once successful. It is still decidedly readable in parts and ranks with the best satires of its kind. It went through five editions in two years, the last being suppressed by its author, because he had become the friend of many of his victims.

Meanwhile Byron had settled — if such a word may be used of his riotous occupation of his domain — at Newstead Abbey, and had repaired it on borrowed money. In March 1809 he took his seat in the House of Lords. Then he prepared himself for a tour of the Continent, which was begun with Hobhouse and three servants in July. That Byron was to any marked extent as dissipated and misanthropical as his own *Harold* does not seem likely.

The travelers sailed to Lisbon and saw something of Portugal, Spain, Malta, Albania and Greece. At Athens Byron finished the first canto of 'Childe Harold' and celebrated the charms of his landlady's daughter, Theresa Macri, the «Maid of Athens.» Then the friends visited Asia Minor and reached Constantinople shortly after Byron's famous swim from Sestos to Abydos (3 May 1810). About two months later Hobhouse returned to England and Byron to Athens, where, after a tour of the Morea, he spent the winter of 1810-11 apparently studying and writing and making excursions. He reached England, by way of Malta, about 20 July 1811.

Throughout his travels he had been in severe financial straits, which his mother had shared. Immediately on his return she was taken ill, and before he could reach her she died. He mourned for her in a passionate way, and the practically simultaneous deaths of three friends also afflicted him and gave him an excuse for writing melancholy verses. He had brought to England the first and second cantos of 'Childe Harold' and his paraphrase of the 'Ars Poetica,' the 'Hints from Horace.' The latter, which he is said to have preferred, was immediately accepted by a publisher, but for some reason it did not appear during Byron's life. 'Childe Harold,' after some delay, was the means of uniting its author with his famous publisher, John Murray. It appeared in March 1812, after Byron had made a successful speech in the House of Lords. As all the world knows he awoke one morning and found himself famous as a poet; it is no wonder that he put a parliamentary career, in which he might have done great good, forever behind him.

It has been for some years fashionable to sneer at the earlier cantos of 'Childe Harold'; but they are at least effective poetry, and their novel theme and romantic tone fitted them for the early readers who went wild over them. Melancholy and cynicism in a youth were more likely to attract than to shock men and women who were subjects of the Regent and contemporaries of Napoleon. Byron, who had previously made a fast friend of his would-be adversary, Thomas Moore (q.v.), became the social lion of the day. He was young and reckless, and unfortunately gave occasion for scandal through his relations with the notorious Lady Caroline Lamb and the equally frail Lady Oxford. People could also gossip about his handsome face and his drinking, and his strange diet for the reduction of his disfiguring obesity. His pecuniary difficulties, too, and his folly in presenting the money from his copyrights to his connection, Dallas, doubtless caused tongues to wag. He enjoyed his vogue, but not to such an extent as to grow idle. After the failure of the anonymous 'Waltz,' he gave the world 'The Giaour' in May 1813, 'The Bride of Abydos,' in December of the same year, and 'The Corsair' two months later. All were dashed off, all were very popular, all deepened the atmosphere of mystery about him. Scott's supremacy as a romantic poet passed to the newcomer, and although the lines on the Princess Charlotte caused some hard feeling and he threatened to quit poetry, Byron continued for two years to have his fling both as a poet and as a gay man of the world. 'Lara' appeared in August 1814; 'Hebrew Melodies' in January 1815; 'The Siege of Corinth' and 'Parisina' in January and February 1816. The sums paid by Murray for these poems — Byron, harassed by debt, at last began to be businesslike — show plainly how well the poet continued to hold his public. Except for such lyrics as 'She walks in beauty like the night,' the work of this period has in the main failed to hold later generations. This is due no doubt to an unwholesome desire on the part of a puritanical race "to take it out" upon Byron's far from impeccable character and career, as well as to a natural change of taste toward greater polish and refinement, and to the effect of such a story as that its author wrote the first sketch of 'The Bride of Abydos' in four nights after coming home from balls. That latter-day criticism has been altogether wrong in correcting the excessive praise given by Byron's contemporaries to this facile group of poems cannot be maintained; but it is well to remember that copious power is a good sign of genius, that Byron managed to put into 'The Giaour' not a little narrative vigor and into the whole group of Oriental tales much of the color and the spirit of the East, and that English literature would have been deprived of many beautiful lyric and descriptive passages if he had allowed society completely to turn him from writing verse.

Meanwhile Byron had seen much of Moore and Rogers and had met, after many years, his half-sister, Mrs. Leigh, the "Augusta" of some of his best poems, and the being of all others to whom his heart went out most fondly. In after years his memory and hers were to be clouded by a dark suspicion which, whether true or false, would probably never have soiled the ears of the world but for the jealousy of another woman — his wife. Whether the scandal which Mrs. Stowe (q.v.) spread and which Byron's own grandson, Lord Lovelace, unaccountably revived will ever be substantiated or laid completely to rest is a matter upon which the data for a decision are not forthcoming. In the interim generous minds and hearts will prefer to believe in the purity of the 'Epistle to Augusta.'

The story of Byron's courtship and marriage, while less mysterious than that of Milton, is not a clear one. In 1812 he seems to have been rejected by an heiress in expectation, Miss Anna Isabella Milbanke, four years his junior and a connection of his flame, Lady Lamb. The young woman appears to have been fond of mathematics and theology, to have written poems, to have been somewhat priggish and prudish and very self-centred. Some correspondence was kept up between the pair and, as a marriage seemed likely to steady his habits and better his fortunes, Byron proposed again by letter in September 1814. This time he was accepted. Miss Milbanke was apparently proud of her catch and Byron of his. They were married on 2 Jan. 1815 and they seem to have got on well at first, though each later made reports to the contrary. The young wife soon inherited money and promised him a child; the poet behaved himself well on the surface, took an interest in the management of Drury Lane, saw something of Sir Walter Scott (always his defender) and helped Coleridge to publish 'Christabel.' But the pair were evidently incompatible, and after the birth of their only child, Augusta Ada, on 10 Dec. 1815, a separation was arranged for, Lady Byron believing that her husband was insane — a notion obviously stupid, but possibly charitable from her own point of view. The doctor, the lawyer and the father-in-law she let loose upon Byron may have irritated him into conduct that did not allay her suspicions. It is all a tangle; perhaps the easiest way out is to censure Byron and resolutely refrain from admiring his wife.

The separation was followed by an astonishing public clamor against Byron, whose friends seem to have thought his life in danger. Sir Leslie Stephen has contended that the public indignation was not unnatural. Perhaps it was not, in the sense that it represented some of the worst elements of human nature. For a society that tolerated the Regent and his boon associates to fawn upon a man and then to condemn him unheard on the score of practically unspecified charges was simply to put an indelible blot upon Englishmen of the upper and middle classes — a blot the blackness of which may be somewhat gauged from the depth of the vindictiveness with which Byron's fame has been since attacked by many of his countrymen. It by no means follows, however, that Byron was at all justified in writing and publishing his numerous poems and passages relating to the separation — though literature would do ill without 'Fare Thee Well,' and would like to have had a chance to see his destroyed novel on the 'Marriage of Belphegor' — or that he can be excused for much of his conduct during the exile that began at the end of April 1816 and lasted for the rest of his spectacular life. One can, however, pardon his constant desire to shock the British public; and, taking account of his temperament, one can understand his varying moods of conciliatory tenderness and defiant scorn toward his implacable wife.

Byron first visited Belgium, traveling luxuriously. Then he went, by the Rhine, to Geneva, where he met the Shelleys and Claire Clairmont, who had made up her mind in London to be his mistress. She bore him in January 1817 a daughter, Allegra, with whom he charged himself and whose death in 1822 grieved him deeply. The intercourse with the Shelleys at Geneva was probably more beneficial to Byron than to Shelley. 'The Prisoner of Chillon,' the most popular of his poems of the type, the third canto of 'Childe Harold' which, thanks to Shelley, showed the influence of Wordsworth, the stanzas 'To Augusta' and other poems are memorials of the period and proofs that his experiences had ripened Byron's poetic powers. After the Shelleys returned to England, Byron, with Hobhouse, crossed into Italy.

He was in Milan in October 1816 and then went for the winter to Venice, where he practically remained for three years. His excesses in the Palazzo Macenigo are unfortunately but too well known; yet, although his health and his character suffered from them, to say nothing of his reputation, he did not a little reading, and his poetical genius continued active. The fourth cantos of 'Childe Harold' and 'Manfred,' which date, in part at least, from 1817 and reveal the effects of a visit to Rome, show his genius almost at its zenith, and 'Beppo,' suggested by Frere's 'Whistlecraft Cantos' preluded the greatest of his works — perhaps the greatest of modern English poems — the incomparable medley, 'Don Juan,' the first canto of which was written in September 1818. The first two cantos, between which he wrote 'Mazeppa,' were published, without indication of either author or publisher, in July 1819.

Meanwhile Byron had met the Countess Teresa Guiccioli, the young, beautiful and accomplished daughter of Count Gamba of Ravenna. They became passionately attached to each other, and, aided by the customs of the country, were constantly together at Ravenna and other places, Venetian society finally giving them up when she resided under his roof. After some extraordinary business negotiations with the lady's elderly husband, it looked as if the temporarily weary lover might regain his freedom; but finally the affection of the Countess prevailed, and Byron, yielding to an influence higher and better than any he had known of late, established himself near her at Ravenna at the end of 1819. Here for a time, at her request, he gave up 'Don Juan,' and, after some translating from the Italian poets, began to write dramas.

His first play was 'Marino Faliero,' in writing which Byron departed from English models and made a diligent study of authorities. It was finished in the summer of 1820 and played unsuccessfully at Drury Lane the next spring. The year 1821 saw the writing of the more effective 'Sardanapalus,' 'The Two Foscari,' the powerful, though not stylistically adequate 'Cain: a Mystery,' 'Heaven and Earth,' another 'Mystery,' and the inception of 'Werner,' his best acting play, taken largely from Harriet Lee's (q.v.) story 'Kruitzner.' That Byron had little dramatic genius is generally admitted; the literary power which he could not avoid putting into any composition is not, in the case of these experiments, sufficiently recognized.

While writing his dramas, Byron had more trouble with Count Guiccioli, who was finally separated from his wife, and he was led by the Gambas to take a deep interest in the Carbonari conspiracies. He had already in his poetry given evidence of liberal political sentiments; now he subscribed for the patriotic cause, headed a section of the conspirators, and, but for his birth and fame, would have got into trouble with the Austrian authorities. The Gambas and the Countess were exiled from Ravenna, and Byron, after some lingering, joined them at Pisa in November 1821. Here he saw much of Shelley, Medwin, Trelawny and other Englishmen, and here some time in 1822 he wrote an ineffective drama, 'The Deformed Transformed.' The same year he made with Shelley and Leigh Hunt (q.v.) the unfortunate arrangements which induced the latter to come to Italy and begin the publication of the quarterly journal, *The Liberal.* The details of this affair are too complicated to be entered upon without ample space. Shelley was imprudent, Byron rather brutal, Hunt exasperating. Shelley's death complicated matters still further, and *The Liberal* expired after four numbers. Its most memorable item was Byron's masterly satire upon Southey, 'A Vision of Judgment,' written in 1821. This Murray had been chary of publishing after the trouble he had had with the orthodox on account of 'Cain' — an episode which had a good deal to do with Byron's willingness to establish a journal the chief expense of which he knew would fall on himself.

Meanwhile 'Don Juan' had been taken up once more, in a deeper vein, and the Gambas had been ordered to leave Tuscany. Byron, whose health and spirits were impaired, followed them to Genoa in the autumn of 1822. Here he wrote his satire 'The Age of Bronze,' upon the political reaction of the time, as well as his poor narrative poem 'The Island' and the later cantos of 'Don Juan.' He was growing restless and feared that he was losing his powers; but, fortunately, for his fame at least, a new outlet for his energies was at hand. A Whig and Liberal committee was formed in London to aid the Greek revolutionists and at Trelawny's suggestion Byron was made a member. He proposed to go in person to the Levant, and by midsummer of 1823 he completed his elaborate preparations for the expedition. Sailing from Genoa, with rising spirits, he reached Cephalonia early in August. Here he remained four months writing excellent letters of advice and sensibly waiting for a clear opportunity for action, not, in all likelihood, for an offer of the Greek crown. At the end of December 1823 he accepted the invitation of Prince Alexander Mavrocordatos to co-operate in the organization of western Greece and sailed for Missolonghi, where he was cordially welcomed. He appears to have shown great tact in harmonizing opposing factions and considerable practical genius as an organizer. He had no chance to lead into action the wild troops over whom he was placed as commander-in-chief, but he did hold out successfully against a mutiny, awing by his courage the Suliotes that broke into his tent while he was ill. He recovered somewhat, but exposure to fatigue and the constant rains told heavily upon him, and he took no care of himself. At last he was prostrated with ague and received only the crudest medical attention. After much delirium he passed into a long slumber, which ended in his death at six o'clock in the evening of 19 April 1824. The news was a shock to the world. His body was sent to England and was buried, not in Westminster Abbey, but at Hucknall Torkard, near Newstead Abbey. The Greeks would have liked, more appropriately, to bury him at Athens, and, fortunately, they did secure his heart for interment at Missolonghi. There is no incongruity, however, in thinking of him as reposing, after his stormy life, in company with his passionate mother and his long line of wild ancestors.

Byron's position in English literature is a much disputed matter. Foreigners, influenced by the spell cast by his genius upon the romantic writers of their own countries as well as by his devotion to freedom and by the fact that his work in translation does not offend by its slipshod features, almost unanimously — whether they be Frenchmen, or Germans, or Italians, or Spaniards, or Russians,— place him only below Shakespeare. The English-speaking world knows the work of Chaucer, Spenser and Milton too well to admit such a high estimate of his genius; but it seems to have gone farther astray in depreciation than foreigners have in appreciation of his extraordinary gifts and achievements. With a few honorable exceptions like Matthew Arnold, English critics have magnified Byron's plain moral and artistic delinquencies and have minimized his powerful intelligence, his great range of work — he is one of the best of letter writers and the most brilliant of satirists, as well as the arch-romantic and revolutionary poet, and a notable descriptive and lyric one — his copius creative power, and his great «sincerity and strength.» They have judged him as somewhat finicky connoisseurs of verse rather than as impartial appraisers of literature. They have underestimated the hold he has kept upon youth and the attraction which his later work, especially 'Don Juan,' so frequently exercises upon intelligent men of mature years. Whether he will ever receive his due from the more cultured of his countrymen is problematical; but there have been indications of late that a less banal attitude is being taken toward both him and his works. He may not be the greatest English poet of modern times, but he is certainly the most effective of all the enemies of cant. See CHILDE HAROLD'S PILGRIMAGE; DON JUAN; MANFRED; VISION OF JUDGMENT.

Bibliography.— The bibliography of Byron is naturally immense. His memoirs, given to Moore, were burned, after many family complications, in 1824. Moore's 'Life, Letters and Journals of Lord Byron' (1830) is the standard biography. It was included in Murray's edition of the collected 'Life and Works' (1832–35; 17 vols., 1837). The number of separate editions of the poems and of translations is enormous, all previous editions being superseded by Murray's edition of the works in 13 volumes (6 of prose, edited by R. E. Prothero, 1898–1901; 7 of verse, edited by E. H. Coleridge, 1898–1904). The best one-volume edition of the poems is that by Coleridge (1905); the [American] Cambridge edition by P. E. More (1905) is also good. The large list of memoirs and books of biographical value may be represented here by Karl Elze's 'Lord Byron' (1870), Emilio Castelar's 'Vida de Lord Byron' (1873), J. C. Jeaffreson's 'The Real Lord Byron' (1883), John Nichol's 'Byron' in the 'English Men of Letters' (1880) and Roden Noel's volume in the 'Great Writers' series (1887). Reminiscences by Lady Blessington, Medwin, the Countess Guiccioli, E. J. Trelawny, Hobhouse, Leigh Hunt and many others should also be consulted. Of critical essays, favorable and unfavorable, those by Matthew Arnold, Charles Kingsley, Mazzini, Macaulay, John Morley, J. A. Symonds and Swinburne may be mentioned. Among more recent studies are 'Byron: The Last Phase,' by Richard Edgcumbe (1909) and a work in two volumes by Ethel Colburn Mayne (1912–13). The mass of continental criticism is very large and is steadily increasing.

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BYRON, Harriett, a character in Richardson's novel, 'Sir Charles Grandison.' She was attached to the hero and was the writer of the greater part of the letters comprising the novel.

BYRON, Henry James, English dramatist and actor: b. Manchester, January 1834; d. London, 11 April 1884. He studied at first for the medical profession, and afterward for the bar, but his passion for the stage caused him to abandon them. He was the first editor of *Fun*, and also started another paper entitled the *Comic Times*, which soon ceased to appear. He wrote an immense number of pieces, including a great many farces, burlesques and extravaganzas, besides comedies or domestic dramas, such as 'Fra Diavolo' (1858); 'Cyril's Success,' probably his best work; 'Dearer than Life'; 'Blow for Blow'; 'The Lady of Lyons'; 'Uncle Dick's Darling'; 'The Prompter's Box'; 'Partners for Life'; and 'Our Boys' (1878), which had a run of four years and three months, the longest on record.

BYRON, John, English naval officer: b. Newstead, 8 Nov. 1723; d. 10 April 1786. At the age of 17 he sailed with Lord Anson on a voyage round the world, but was wrecked on the coast of the Pacific, north of the Straits of Magellan. Byron, with some of his unfortunate companions, was conducted by the Indians to Chile and remained there till 1744, when he embarked on board a ship of Saint Malo, and in 1745 returned to Europe. At a subsequent period he published a narrative of his adventures, which is extremely interesting. In 1758 he commanded three ships of the line and distinguished himself in the war against France. George III, who wished to explore the part of the Atlantic Ocean between the Cape of Good Hope and the southern part of America, gave Byron command of a frigate, with which he set sail in June 1764. After having circumnavigated the globe he returned at the end of two years to England, where he arrived in May 1766. Although Byron's voyage was not fruitful in discoveries, it still deserves an honorable place in the history of voyages round the world, since he was the first of those renowned circumnavigators of the globe, including Wallis, Carteret and Cook, whose enterprises were not merely mercantile, but were directed to scientific objects. In 1769 Commodore Byron was appointed to the government of Newfoundland, which he held till 1772. He was raised to the rank of vice-admiral in 1778, was worsted by d'Estaing in an indecisive action off Granada in 1779 and died in 1786. Such was his general ill fortune at sea that he was called by the sailors "Foul-Weather Jack."

BYRON BAY, a bay on the northeastern coast of Labrador, situated about lat. 55° N., and long. 58° W., and north of Hamilton Inlet. The width of the bay is about 50 miles.

BYRON ISLAND, Micronesia, a small island of the Gilbert group, in the Pacific Ocean, about 12 miles in length, abounding in cocoanuts. It was discovered by Commodore Byron in 1765, and belongs to Great Britain.

BYRON'S LETTERS. The letters of Lord Byron are numerous. In Moore's 'Life of Byron' 560 appear. It is reasonable to suppose that his biographer did not select the least interesting, and we are thus able to form a tolerably accurate judgment of Byron's merits as a letter-writer. The chief qualities revealed in these letters are naturalness, good sense and straightforward sincerity. He writes much about himself, as every good letter-writer must, but with no more egoism than is usually displayed in a frank communication between friends. The character thus revealed is at total variance with the character invented for him by his critics and his enemies, and partially sustained by the nature of his poems. He appears as the very reverse of a sentimentalist. There are few passages of tenderness; even when he speaks of the death of his daughter, Allegra, for whom he had a deep affection, he does little more than record his loss in the simplest language. In speaking of the death of Shelley the same restraint is practised; beyond a brief picture of the romantic scene on the shore at Pisa, where the body was burned, there is nothing that reveals the poet. He is at his best when describing his own daily life, his literary aims and ideals and his opinions of his contemporaries. In describing his fellow-writers he sometimes has a flash of true illumination, but his habitual attitude is hostile and satiric. For Walter Scott he has a genuine appreciation; but the rest move him only to contempt — "Southey twaddling, Wordsworth drivelling, Coleridge muddling, Bowles quibbling, squabbling and snivelling — Barry Cornwall will do better by and by, if he don't get spoiled by green tea and the praises of Pentonville and Paradise Row."

It is the pervading quality of robustness which is the chief characteristic of the 'Letters.' There is nothing of the delicate word-felicity of Edward Fitzgerald, nor of his fine literary discrimination. There are none of those passages of wild imagination and prophetic passion which give to Carlyle's letters a place in literature equal to that attained by his most deliberate essays and histories. Nevertheless he can strike out memorable phrases, as when he speaks of the unpublished letters of Burns as revealing a strangely antithetical mind — "dirt and deity — a compound of inspired clay."

Nor are his thoughts upon life and religion without value, though to the modern mind, familiar with the problems of philosophic doubt, his reflections may appear to have little depth or originality. They are, however, the sincere utterances of a mind in revolt against the sluggishness of conventional opinion, and intent upon a freedom which few were bold enough to seek. Upon the whole, it may be said that the real Byron is more faithfully depicted in his letters than in his poetry. We cannot read them without being aware of a mind possessing great natural force, characterized by a trenchant sanity, a hard, clear vision of material facts and a justness of apprehension which belong more frequently to the great critic than the popular poet.

W. J. DAWSON.

BYSSUS, bĭs'sŭs, a kind of fine flax, and the linen made from it, used in India and Egypt at a very early date. In the latter country it was used in embalming, and mummies are still found wrapped in it. As an article of dress it was worn only by the rich. Dives, in Christ's parable (Luke xvi, 19), was clothed in byssus, and it is mentioned among the riches of fallen Babylon (Rev. xviii, 12). Byssus was formerly erroneously considered as a fine kind of cotton. The fine stuff manufactured from the byssus is called more particularly "sindon." Foster derives the word byssus from the Coptic. Byssus was also used by the ancients, and is still used to signify the hairlike or threadlike substance (also called the beard), with which different kinds of sea-mussels fasten themselves to rocks. *Pinna marina,* particularly, is distinguished by the length and silky fineness of its beard, from which very durable cloths, gloves and stockings are still manufactured (mainly as curiosities) in Sicily and Calabria.

BYSTRÖM, Johan Niklas, Swedish sculptor: b. Filipstad, Wermland, Sweden, 18 Dec. 1783; d. Rome, 11 March 1848. He studied art under Sergell in Stockholm, and in 1810 went to Rome. In 1815 he returned, and winning the favor of the Crown Prince by his statue of the latter, received several important commissions. Several years before his death he again took up his residence in Rome. Among his more important works are 'Drunken Bacchante'; 'Nymph Going into the Bath'; 'Reclining Juno'; 'Hygieia'; 'Dancing Girl'; a polychrome marble statue of 'Victory' in the palace at Charlottenburg; a statue of Linnæus and colossal statues of Charles X, XI, XII, XIII, XIV, and Gustavus Adolphus.

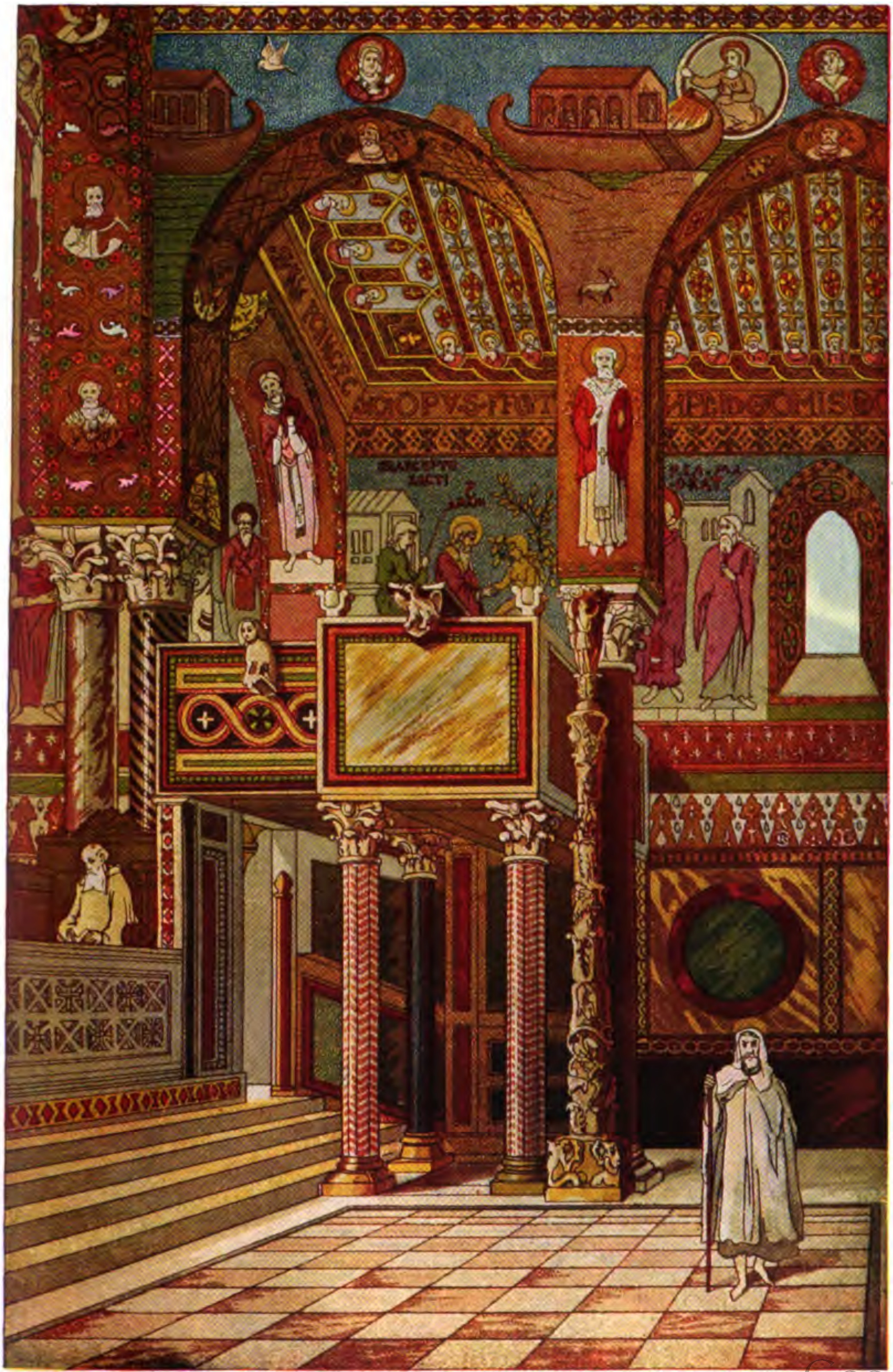
BYWATER, Ingram, English scholar: b. London, 27 June 1840; d. 17 Oct. 1914. He was educated at University College and King's College schools, London, and Queen's College, Oxford. He was Regius professor of Greek at Oxford University 1893–1908. Among his works are 'Fragments of Heraclitus' (1877); 'Works of Priscianus Lydus' (1886); 'Textual Criticism of the Nicomachean Ethics' (1892); 'Aristotle on the Art of Poetry, with Translation and Commentary' (1909).

BYZANTINE ARCHITECTURE designates the style and type of architecture which were developed in the Byzantine empire after

BYZ [illegible]

PALATINE [illegible]

BYZANTINE ARCHITECTURE



PALATINE CHAPEL AT PALERMO

the fall of Rome, and which spread thence westward into Italy and northward into what is now Russia, where it still persists in attenuated and almost grotesque form. The pictorial and decorative art associated with this architecture was widely diffused through Europe (see PAINTING), and materially affected Western art. With the final division of the Roman empire between Honorius and Arcadius (395 A.D.), Constantinople became not only the capital of the Eastern or Greek empire, but the most important city of Christendom; the chief centre for centuries of Christian art and learning, especially of Greek culture as distinguished from the Latin, and of the Eastern Church as distinguished from that of Rome. Under the great Emperor Justinian (527–65 A.D.) there ensued an extraordinary activity in the building of churches, not only in the capital but in Syria, Dalmatia and Macedonia and in Ravenna, the seat of the Byzantine Exarchate of Italy. This architecture was chiefly the work of Asiatic Greeks, who introduced into the construction of churches certain traditional Asiatic forms and methods, especially in types of vaulting in brick or stone. They abandoned the distinctive Latin type of church — the basilica, with its three aisles and wooden roof — and substituted for it new types both of plan and construction, of which the dominant feature was invariably a central dome, raised above the surrounding structure and pierced by a ring of windows at its base. They revived certain features of Roman secular vaulted buildings and blended with these an Oriental taste for applied decoration in color, creating out of this combination a wholly new style and new effects. The style thus evolved matured with extraordinary rapidity and then began a long and gradual decline. If we take the baptistery of the Orthodox and the tomb of Galla Placidia, both at Ravenna, and dating from about 450 A.D., as the earliest examples of the style, less than a century elapsed between its birth and its culmination in the unsurpassed church of Hagia Sophia at Constantinople (532–38 A.D.). This masterpiece was never equaled in scale or magnificence thereafter. Five centuries later, however, in the church of Saint Mark at Venice (1047–71; the façade later) the style flowered in a new masterpiece of great beauty, at the hands of Greek and Italian artists. No other extant example approaches these two in magnificence and artistic merit. During the reign of Justinian several other splendid churches were built at Constantinople and Jerusalem, but even these were far inferior to Hagia Sophia. Except in the one instance of Saint Mark's, all the later churches were relatively small in dimension and timid in construction.

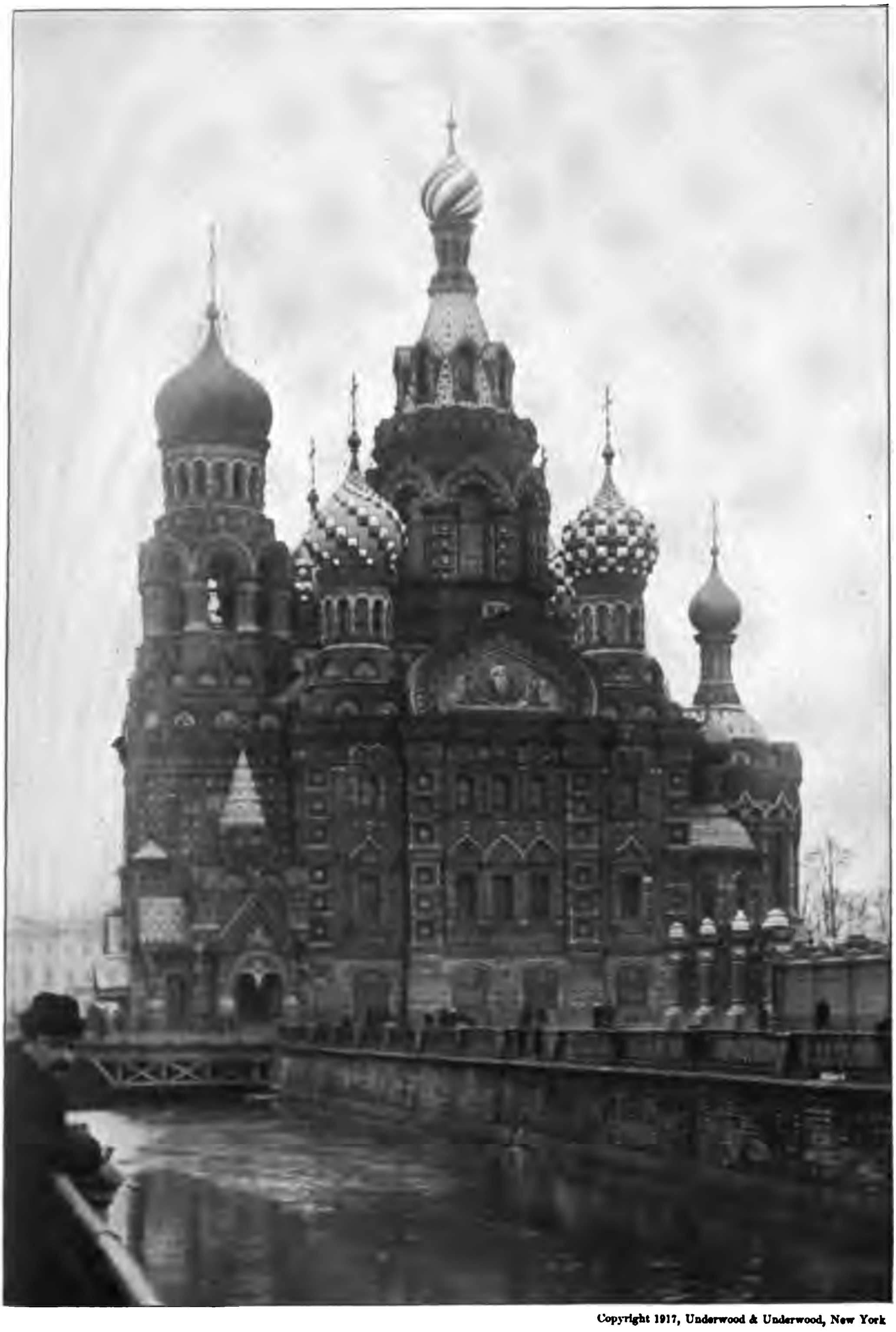
Characteristics.— The dominant feature of the style is the central dome on pendentives. The pendentive is a device by which a circular dome can be erected upon four or more isolated supports, instead of upon a continuous circular wall. It consists of a triangular portion of a sphere comprised between two adjacent arches and a horizontal circle touching their summits. Four such surfaces carried by four arches bounding a square meet at the top in a circle to form the base of the dome, or of a circular drum upon which the dome is to rest. By means of eight piers, with their arches and pendentives, the dome may be built over an octagonal space. In either case the openings between the piers allow the floor-plan to be extended in any direction, so that the dome may be used in connection with almost any type of ground-plan; whereas in previous styles it had been almost wholly confined to circular structures, as in the Pantheon at Rome. The Byzantine plans were therefore very varied, and were vaulted throughout in brick. The construction of these domed and vaulted buildings, which were nearly all ecclesiastical, was based generally on the Roman principle of massive internal piers and intermediate columnar supports; but the Byzantine columns carried arches instead of entablatures like the Roman. External buttressing above the roofs of side-aisles or other low portions was another Roman feature derived from bath-halls and the Basilica of Maxentius. Roman also were the system of wall decoration by incrustation with slabs of richly veined marble, the use of marble in decorative patterns for floor-pavements, and the employment of monolithic column-shafts of polished granite, porphyry and marble, at once structural and decorative. On the other hand, the Byzantine conception of interior adornment as a covering of all surfaces, both of walls and vaults, with a veneer of perfectly flat decoration in color, broken up into minute units, was distinctly Oriental. All carving in high relief was replaced by delicate all-over patterning in very flat low relief, and above the marble wainscoting the walls and vaults were covered with mosaic of minute glass *tesseræ* (see MOSAIC) in brilliant colors usually on a gold ground. These mosaics were partly pictorial, representing Christ, saints, apostles and other religious or Biblical subjects, and partly conventional patterns. The Roman types of capital were replaced generally by new types of simpler mass covered with flat-relief carving of foliage and basketwork, and impost-blocks were often introduced between the caps and the heavy arches which they carried.

History and Monuments.— The germs of the style are seen in certain early Christian buildings in Syria and in Diocletian's palace at Spalato, which was probably built by Syrian or Byzantine workmen; more clearly in two 5th century buildings at Ravenna — the baptistery of the Orthodox, having a dome over an octagonal substructure and the tomb of Galla Placidia, a cruciform edifice with a square "lantern" rising above the arms at their intersection, crowned by a dome on rudimentary pendentives. Doubtless, however, the original prototype of one class of Byzantine churches having a central square or octagon surrounded by an aisle is to be found in two Roman buildings erected by Constantine — the baptistery of the Lateran and the tomb of Constantia (Santa Costanza). The roof of the high central part of the former was of wood; of the latter, a masonry dome. The evolution of the central space with a dome on eight supports may be traced through early examples in Syria to Saint Sergius at Constantinople (520 A.D.) where alternate sides of the octagon were occupied by open columnar niches or apsidioles projecting into the surrounding aisle, thence to San Vitale at Ravenna (525 or 527), where there are six such apsidioles; the easternmost bay being in both these churches extended to form a chancel and apse;

and finally to its culmination in the new type of plan seen in Hagia Sophia (The Divine Wisdom, often called "Saint Sophia"; now a mosque). This extraordinary edifice, the work of two architects from Asia Minor, Anthemius and Isodorus, was built under the orders of Justinian in six years (532–38) to replace an earlier church destroyed by fire during a race-course riot. It occupies a broad rectangle, measuring nearly 300 by 240 feet, and consists of a central nave 243 by 115 feet covered by a dome 107 feet in diameter and 180 feet high, and two half-domes of 100 feet span opening into the two transverse arches of the four that carry the dome. This hall is flanked by two vast aisles, 60 feet wide, each divided into three parts by two massive buttresses which rise above the roofs of the two-storied aisles. This triple division of the aisles by transverse buttress-masses which rise above the aisle roofs is plainly derived from the traditional form and construction of the Roman thermæ, probably through the intermediary Basilica of Maxentius of the early 4th century. A narthex across the west front preceded by an atrium or fore-court, and the projection of the apse at the east end, make up the total length of 300 feet. Open columnar apsidioles expand the semi-circular ends of the nave, and recall the six similar apsidioles between the piers of San Vitale at Ravenna. The interior is resplendent with polished columns of costly marble, verd-antique and porphyry, with marble wainscot and superb mosaics, though all human figures have been concealed by gilding and paint on account of Moslem prejudices. The furniture of the church, which was of unrivaled cost and splendor, disappeared centuries ago. In this stupendous work we seem to see the plan of Saint Sergius cut in two and between the two halves an immense square interposed, covered by a gigantic dome on pendentives rising far above the rest of the building. On the other hand, the cruciform type first shown in the tomb of Galla Placidia culminated, also in Justinian's time, in the church of the Apostles at Constantinople. This had five domes, one on each arm of the cross and a central dome dominating the whole. This splendid church was demolished in 1463 by the conquering Sultan Mehemet II, but it had already served as the model for the builders of Saint Mark's at Venice.

With the exception of this last named church, none of the other Byzantine churches of Constantinople was of large size. The only other church of Justinian's time that has survived to our day is that of the Holy Peace, Hagia Eirené (miscalled "Saint Irene"), now used as a museum of arms. It is, however, a poor example, destitute of all embellishments, and is really a late (8th century?) and hasty reconstruction of the original edifice. With its two domes it may have served as the model for the Cathedral of Cahors, France. The later examples of the style in Constantinople were relatively small in scale, sometimes complex in plan, with small domes on high drums (Saint Theodore, Pantokrator, Moné tes Choras, etc.). About 40 of these small churches are extant, mostly transformed into mosques; and only one of them retains any considerable part of its original decorations. This one is the Moné tes Choras, now known as Kahrié Jami, dating probably from the 11th or 12th century, with a narthex adorned with mosaics and frescoes which, uncovered about 1880, the Turks have allowed to remain exposed. There are a number of late Byzantine churches in Athens — all of singularly small size — and at Salonica several of various dates (Saint George, Saint Elias, Saint Bardias, Saint Sophia); besides interesting monastic groups in Macedonia, at Meteora and on Mount Athos. In Russian Armenia (Ani, Etchmiadzin, etc.) the style took on a distinct provincial character, with stone pyramids instead of domes as the outer form of the cupola on a high drum, and often with highly interesting carved interlace ornament. The singular and barbarously fantastic forms of shurches at Moscow, Kiev and other Russian cities (e.g., the Saint Basil in the Kremlin in Moscow) are remotely derived from the tall-drum domed "lanterns" of the late Byzantine type. Near the middle of the 11th century the destruction by fire of the church of Saint Mark at Venice turned the attention of the Venetians toward Constantinople as the source from which to obtain architects and decorators capable of rebuilding worthily the venerated shrine of the evangelist. Architecture was at that time in Italy only beginning to revive from its low estate, and the native artists and the native art appeared inadequate for the task in hand, except as they were guided and assisted by Byzantine architects. The new church, measuring about 220 by 180 feet, was erected on the cruciform plan of the Holy Apostles' Church at Constantinople, with five domes, of which the central was slightly larger than those on the four arms. The very active Venetian commerce with the East brought in an extraordinary wealth of artistic material — antique columns, veined marbles, carvings from ruined or dismantled churches — and with these and the embellishments of mosaic by Greek artists and their Italian pupils, as well as by later additions of sculpture and furnishings, the interior was made resplendent beyond any other church in Italy or western Europe. Lacking the overwhelming majesty and unity of Hagia Sophia, it has nevertheless an extraordinary beauty of its own. The main construction was completed in 1071; the domed narthex dates from the 12th century, with the extraordinary and marvelously picturesque façade; the wooden exterior domes and Gothic pinnacles were added in the 15th century: some of the mosaics are modern. Unlike the Byzantine churches of the East, which almost wholly lack external embellishment, Saint Mark's is revetted externally with paneling of fine marble. Strange to say, it was never copied or imitated, except in the Romanesque church of Saint Front at Périgueux (France), which however is totally lacking in the embellishments of marble and mosaic that make up so much of the splendor of the Venetian model. Quite as surprising is the fact that Hagia Sophia, the noblest of all Byzantine monuments, remained absolutely unique and unimitated until the Turkish conquest. It was the Turkish mosque-builders who seized upon its superb possibilities and developed from them a new and splendid type of architecture for their own requirements (see MOHAMMEDAN ART).

An interesting lateral branch of Byzantine architecture is seen in the monasteries erected by Coptic Christians in Egypt, in the 6th–9th



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Cathedral of the Resurrection of Christ, Petrograd

centuries, recently explored by the Metropolitan Museum of Art of New York. The domes and surface-carvings of these buildings strongly influenced the development of the Arabic art of Cairo. The great mosque at Jerusalem, known as that of Omar (more properly the Dome of the Rock, Kubbet-es-Sakrah) is probably a reconstruction of the church built on Mount Moriah by Justinian. The decline in the size and splendor of the Byzantine churches built after the 6th century was due to the slow decay of the empire itself in both political and military prestige and power. Those erected in Greece and the Danubian provinces were often of almost microscopic size. The «Old Cathedral» at Athens measures 37 by 32 feet; the dome of another church in the same city is but seven feet in diameter. Many of the later churches have three apses, one at the end of each aisle; and in all the examples after the 7th century the dome is carried on a high drum pierced with windows, forming a «lantern,» whereas in the earlier churches the windows penetrate the base of the dome itself. Another innovation was the introduction, into the wall of the main structure, of arched windows coupled in pairs under a discharging arch, often with a mullion or midwall shaft between the two. This feature, together with the central lantern or high cupola over the crossing, was adopted by the Romanesque church-builders of Italy and France in the 11th and 12th centuries, and both became important features in the Western Romanesque style. The partial copying in France of Saint Mark's, and perhaps of Hagia Eirené, at Périgueux and Cahors has been referred to. Besides these there are in Aquitania and in the valleys of the Loire and Charente a large number of domed churches of the 12th century due to Byzantine influence, partly by way of Venetian commerce, partly (according to Enlart) by way of Cyprus where the Crusaders established important Latin Christian communities.

Of the Byzantine secular architecture there are hardly any remains. Doubtless the palaces of the emperors were of great splendor, but the only extant ruin of any importance is that of the palace of the Porphyrogenitus near the Blachernæ at Constantinople, of which the walls of the great hall are still standing, but with no vestige of its interior decoration. The vaulted cisterns of the city are still intact, and at Ravenna the front wall of the so-called palace of Theodoric. There are a number of Byzantine fortifications in ruins in various cities of the empire, and Byzantine military architecture was of great importance; but these examples are so ruinous or have been so often and so completely rebuilt in later ages that further notice in this article is unnecessary.

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BYZANTINE ART. The style which prevailed in the Byzantine or Eastern Roman empire as long as it existed (330–1453) and which has prevailed since in Greece, in the Balkan Peninsula and in Rumania, southern Russia and Armenia, with other parts of Asia Minor. Byzantine art is divided into four periods: (1) From the Foundation of Constantinople (330 A.D.) to the beginning of the Iconoclastic Period.— This represents the experimental period and the golden age of Byzantine achievement. Figure sculpture had not yet become dominated by Eastern ideals, and was largely realistic in treatment, but by the 6th century mosaics were splendidly conventionalized and attained great beauty. The Byzantine style of architecture became distinctive about the year 450 A.D. The great development of trade between the East and the West led to its rapid development. The great buildings of this period were Holy Wisdom (Hagia Sophia) in Constantinople, the early basilicæ in Rome and the early churches at Ravenna, etc. The artistic centres of the Near East were at first Alexandria and Antioch, and later Byzantium itself. (2) The second period is that known as the Iconoclastic Period.— The Emperor Leo III (717–40 A.D.) was an adventurer from the mountainous regions of Isauria. Gibbon narrates that he was «ignorant of sacred and profane letters; but his education, his reason, perhaps his intercourse with the Jews and Arabs had inspired the martial peasant with a hatred of all images.» One reason for this hatred can be found in the fact that many of the people were beginning to endow the images with mysterious power, believing they could work miracles and were in some occult way the medium of the saints. In spite of the opposition of the people, whose sympathies were monastic, and who were led by the priests themselves, Leo joined the iconoclastic party, which thought the growing power of the monks a danger to the state. He began to wage war against all sacred imagery, causing numberless works of art to be destroyed, and prohibited the further production of religious art of a monumental kind. This proscription did not have for art the disastrous consequences that one might have expected. Religious art, persecuted, continued to increase despite the strife. Hundreds of artists and craftsmen also, prohibited from following their callings, turned from religious to Hellenistic motives, and devoted themselves to ivory and goldsmith's work, miniature painting and conventional decorative design, Eastern in inspiration. By about the middle of the 9th century, mosaic and painted figures began to be used once more in decoration, and a general artistic revival set in, furthered by the growing prosperity of the empire under the Macedonian dynasty. (3) The third period dates from the beginning of the Macedonian Dynasty (867 A.D.) to the sack of Constantinople (1204 A.D.). This was the second great stage of Byzantine art. It was two-fold in character, being imperial and secular, and inspired by classic tradition, while at the same time the monastic art of the times continued and preserved its strict and severe traditions. Masterpieces of each type were frequent, both historic and ecclesiastical. The greatest extant monument of this style and period was San Marco, Venice (11th century. (4) The fourth period is that from the Restoration until the Turkish Conquest (1453 A.D).—Although many fine works of art were produced during this period, it was, on the whole, an age of artistic decline and slow decadence. As the empire was impoverished fewer works were executed in precious metal and ivory.

Byzantine art had no period of struggle and slow development, and passed through no archaic stage. It represented the union of the mature styles of the nearer East and West, and showed small desire to draw fresh truth from nature, being content instead to blend the stored fruits of its knowledge for the production of its masterpieces. Its chief element was not so much the art of Rome, but of Sassanid Persia and the Hellenized East. It was from the East that it acquired its dislike of realistic representation, its love of domed and vaulted buildings and its delight in Oriental decorative pattern and sumptuous richness of color. It was above all a great decorative art — formal, splendid, ceremonial and reflecting the set ritual of the court and the Church. We find the key to it, not in nature and the spontaneous joy and beauty of life, but in some such scene as Gibbon has described, when telling of the visit of Luitprand, bishop of Cremona, to the Emperor Constantine VII in the year 948 A.D.: «When he (Luitprand) approached the throne the birds of the golden tree began to warble their notes, which were accompanied by the roaring of two lions of gold. With his companions, Luitprand was compelled to bow and to fall prostrate, and thrice to touch the ground with his forehead. He arose, but in the short time the throne had been hoisted from the floor to the ceiling, the imperial figure appeared in new and more gorgeous apparel, and the interview was concluded in haughty and majestic silence.» Here we have all the set pageantry and conventionality of Byzantine decoration, which was magnificent for its purpose, but which, in the end, was destined to lose its power and force owing to its lack of fresh stimulus and inspiration, and its divorce from life.

Byzantine art was sternly controlled by the Eastern Church which turned in perhaps not unnatural reaction from the pagan love of form, as shown in the sculptures of Greece and Rome, and employed art instead in a decorative manner only, as an expounder of dogma, and an expression of East Christian ideas. In this way it forms an interesting contrast to Gothic art, the product of the Western Church some centuries later, which mirrored faithfully every joy and sorrow of the human heart. Our knowledge of the earliest decorations other than mosaic is very slight. It is gathered from painted manuscripts, book bindings often of metal and ornamented with precious stones, a few enamels, and some glassware, and a very few paintings on wood, forming parts of the iconostasis or choir screen of this or that church of the Greek form of Christianity. The mosaics are the most important decorations of the earlier art, so far as we have any knowledge of it, and these are more familiar to Europe as found in the churches of Ravenna than in any building farther East. The fact that Moslem rule requires the covering up as with whitewash of these representations when a church is taken over for a mosque makes it probable that at some future time many fine early mosaics will be uncovered.

The characteristic of Byzantine art is rich decorative effects almost to the exclusion of accurate drawing or modeling of the human figure or faithful representation of nature in any form. Early or late, the attitudes of personages represented are formal and conventional, but the robes are splendid, the backgrounds are rich and the effect is that of a splendid colored pattern with but slight representative or expressional meaning. Sculpture has never risen to excellence; it is almost limited to decorative carvings, of book covers and sacred objects, reliefs in ivory and casting of small figures in bronze. The earlier statues of emperors and the like are chiefly remarkable for the lingering Roman traditions.

Mosaics and Painting.— In the second Council of Nicea (787 A.D.) the following statement, from its Acts, shows the attitude of the Church at the time toward painting: «It is not the invention of the painter which creates pictures but an inviolable law, a tradition of the Church. It is not the painters but the Holy Fathers who have to invent and dictate. To them manifestly belongs the composition, to the painter only the execution.» This paragraph is interesting in connection with both Byzantine mosaics and painting. It shows us once more how tradition took the place of nature, and led to both the greatness and the weakness of Byzantine art.

The weakness of Byzantine drawing and painting became apparent after the Restoration. Byzantine art had never been dramatic, and had never been filled with the warmth of human joys and sorrows, and when the artistic creeds became outworn and lifeless, the artists had lost their imaginative power, and were content to copy drawings which were often in themselves copies, and to accept such guidance as has been preserved to us in the 'Guide to Painting,' a collection of artistic precepts collected by the monk Dionysius, in the 16th or early 17th century, from the works of an earlier and famous Byzantine painter, Manuel Panselinos of Thessalonica, who may have lived as early as the 13th century. In this guide, exact directions are laid down for the execution of all well-known scenes from Bible history.

Byzantine painting was generally executed in tempera upon plaster or a wooden panel, the outlines of the design being often drawn in with gold. Some of the frescoes are still existing, and the paintings, which were exported by the merchants, have been spread far and wide. Numberless minatures were also produced in the monasteries, and these and the panel pictures exerted an immense influence on the art of other countries, particularly upon Italian art which was brought into such close touch with that of Byzantium. Even at the present day the Byzantine tradition is the chief force in the painting of many parts of Greece, Russia and Asia Minor.

Mosaics were the most splendid expression of Byzantine decorative art. The art, which was an ancient one, had probably been derived from the East, and was raised to a position of importance in Egypt in Ptolemaic times. From there it spread both to the East again and to the West, where in Rome it grew to be very popular. The Byzantines preferred, however, glass *tesseræ* of various colors to the small cubes of colored marbles commonly employed by the Romans.

Gold and silver *tesseræ* were made by laying gold and silver leaf upon the back of the glass and then covering the leaf by a second thin film of glass to protect it. The mosaics were placed in position by means of cement, and the glowing richness of the solemn figures against their golden backgrounds formed a sumptuous and splendid decoration to dome or wall.

In the 5th and 6th centuries Ravenna, then the artistic centre of Italy, was the most famous centre of the mosaic industry, and was renowned for the magnificent mosaic decorations of its churches. In the early days Venice was under artistic allegiance to Constantinople, and among later mosaics those in the churches of San Marco and the cathedral of Torcello, dating from the 11th century, may be mentioned. Fine mosaics were also produced in the Sicilian churches in the 12th century, although in Sicily the Byzantine craftsmen were probably helped by their western pupils.

Sculpture.— One of the immediate effects of Christianity was a distaste on the part of Christians for monumental figure sculpture, which to their minds was associated with the rites of pagan worship. This dislike was also shared by the all-conquering Arabs, who read in the preachings of Mohammed a prohibition of anything appertaining to idol-worship, a fact which no doubt had its influence on the Byzantines who were in constant touch with the Mohammedans. At this time, also, the general trend of opinion as to artistic decoration in the Near East was in favor of elaborate pattern as opposed to a naturalistic treatment of forms, and Byzantine art, being partly Eastern in spirit, shared to a certain extent the common preference. As the nude was not studied in classic times such few figures as were carved soon lost their close relation to life. Figure sculpture became a dependent of architecture and was chiefly concerned with the depicting of members of the Imperial family, high officials or famous characters from sacred story. Delicate gradations of relief were avoided, and carvings were largely confined to two planes so that a strong effect of light and shade, without halftones, should be obtained, and the effect of strong pattern produced. Some of the most beautiful Byzantine sculptures are on the capitals of columns and on the pulpits, or ambones, in the churches. Here we find the most delicate patterns of natural forms, plants, birds and animals, and also entwined scroll-work and geometrical designs. Among the most famous of the carvings are those in ivory, the diptyches, *ikons*, caskets, book covers and tablets, many of which were originally colored and gilded. The goldsmith's work, tapestry, weaving and the art of enameling also attained great beauty, and served to keep the Eastern tradition alive in Europe.

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BYZANTINE EMPIRE, The. Old Byzantium, founded about 688 B.C., lay in ruins after its destruction in 196 A.D. until Emperor Constantine the Great rebuilt the city and made it the capital of the Roman empire instead of Rome (hence called also Roma Nova). Byzantium was chosen on account of the excellence of the site. On 26 Nov. 328 the cornerstone was laid for the extension of the city walls, and on 11 May 330 the solemn dedication of the new city was made. Two large tracts in the centre were adorned with colonnades and statues, while in the hippodrome was placed the famous serpent-column from Delphi. The whole empire was robbed of its finest treasures of art to embellish the new residence. The Emperor's palace was a magnificent congeries of buildings. The colonization of inhabitants was promoted by granting the privileges of Old Rome to the citizens of New Rome: the councillors were called senators, and the same advantages in the way of bounties and amusements were afforded the people of Byzantium as had been enjoyed by the Romans. The city soon grew in territory to 14 districts. But the people lacked unity, for the population consisted of colonists from many different races. Nevertheless, Byzantium was destined to become a seat and centre of learning. The schools of law were soon in a flourishing state. The bishop of Byzantium acquired the rank of a patriarch and laid claims to supremacy over the Oriental Church. Many councils, or conventions, were held in the city, the most renowned of which are the following: in 381 against the Macedonians, in 553 for the settlement of the controversy over the three capitals, in 680 against the Monotholetes, 692 for the ratification of the older ecclesiastical observances, 754 against the adoration of images, 869 against the patriarch Photius, and in 879 in his favor. After the partition of the empire in 395 Constantinople became the residence of the Emperor of the Eastern empire. Under the influence of an immoral, intriguing court, fond of luxury and display, the people degenerated. Living in idleness on the bounties of bread, and caring for nothing except to gratify their passion for the hippodrome, the people split into two factions, who named themselves, after the color of the charioteers, the «Blues» and the «Greens,» and utterly devoid of higher aims fought each other with passionate hate. Under Justinian I this factional strife increased until finally what is known as the Nika insurrection broke out. This sedition raged from 13 Jan. to 20 Jan. 532, and ended with the massacre of at least 30,000 human beings in the hippodrome by Belisarius. Justinian rebuilt the city with great magnificence after its semi-destruction by fire and embellished it with numerous richly adorned churches, the finest of which was the cathedral, Saint Sophia. The strong fortifications protected the city against the violence of enemies. The Avars, strengthened by Bulgarians and Slavs in 626, penetrated several times into the suburbs. In 616 and 626 the Persians under Chosroes appeared before the city walls. The two sieges of the Arabs are particularly celebrated: from April to September 673, when the city was saved by the Greek fire of the Syrian Kallinikos, and 717–18, when Leo the Isaurian defended it. In 1203 the soldiers of the 4th Crusade marched before the walls of the city to restore to the throne Isaac Angelus, who had been dethroned by Alexius. For a long time the inhabitants defended themselves under the leadership of Theodorus Lascaris; but when Alexius on 18 July cowardly took to flight, Isaac was released from prison and restored to the throne, whereupon the leaders of the Crusade marched into and occupied Galata. Meanwhile the bitterness of the Byzantines against the Franks led to an insurrection (February 1204), in which Isaac and his son Alexius were killed. The new emperor, Alexius V. Ducas «Murzuphlos,» was immediately defeated by the Crusaders, who took Constantinople by storm on 12 April after a stubborn fight. In the sacking of the city, which followed the battle, the most magnificent treasures of art were destroyed, while most of the rest were carried off to adorn Venice and the cathedral of Saint Mark; and an enormous booty was taken. On 9 May the Crusaders elected Count Baldwin of Flanders emperor. But the Latin empire also soon sank into a mere semblance of a realm in consequence of internal strife and of the wars with the Bulgarians and Cumani (who under Asén II in 1236 besieged the city) and on account of the rise in power of the Greek empire of Nicæa. Nevertheless, the Italian commercial cities acquired in Constantinople a great influence, especially the Genoese and the Venetians, who settled permanently in Galata. But these too grew weak though factional strife and jealousy. After the restoration of the Greek imperial throne through the Palæologi in 1261 the Genoese and Venetians came to open hostilities. On 22 July a Venetian fleet of 75 vessels appeared before the city, burnt the residences of the Genoese in Galata, and even fired on the town. During the last days of December the Genoese of Galata in retaliation massacred all the Venetians.

About the middle of the 14th century the Othmans began to interfere in the contests for the throne of the Byzantine empire and to threaten Constantinople. After the battle of Nicopolis in 1396 Bajesid besieged the city with great vigor. In 1399 the French Marshal Boucicaut came to its aid, but had to give up in 1401 on account of the approach of Timur. A fresh appearance of the Othmans under Murad II occurred in 1422. He succeeded in taking the outer works. Nevertheless, the great attack of 24 August was repulsed, the siege-works destroyed by a sally, and in 1452 Mohammed II began the construction of a coast-tower which closed the Bosporus, and in the spring of 1453 the siege ended. Enormous machines and heavy cannon were brought up. The army numbered 200,000 soldiers and the fleet 250 ships. To oppose these the defender, Constantine XI Dragades, had only 11,000 Greeks and 3,000 Italian reinforcements, which the Genoese, Giovanni Giustiniani, commanded. In addition to this great disparity in numbers was a further disproportion consisting in the unity of the assailants and the division among the defenders. In Constantinople embittered religious strife raged between the Orthodox and the Unionists (Henotikoi). But in spite of the inequality in strength the besieged, supported by the natural strength of the position and fortifications of the city, repelled the most violent attacks for 40 days. When the emperor, Constantine, refused a voluntary surrender, even with the permission of a free withdrawal of his forces, the city was stormed on all sides, 29 May, and captured. Giustiniani fled, and Constantine met a hero's death in the midst of the battle. In the heat of the conflict the conquerors destroyed everybody that fell in their path. Those that survived were sold into slavery. The city was completely sacked and numerous treasures of art destroyed. At mid-day Mohammed marched triumphantly into the subjugated city and offered up prayers of thanksgiving in Saint Sophia, which became now the principal mosque. Then he ordered all the dignitaries of the empire to be driven into one place and cut down. The city was rebuilt, the fortifications restored, and Constantinople became the capital of the Ottoman empire.

Given in more chronological detail; after the death of Theodosous in 395 the Roman empire was divided between his two sons. Arcadius received the eastern and Honorius the western half. The former (395–408) was a weak ruler: he was under the domination of his successive ministers Rufinus, Eutropius and Gainas, the last being succeeded in power by the Empress Eudoxia. In 408 the seven-year-old son of Arcadius (Theodosius II) ascended the throne. He ruled from 408 to 450. The government was ably carried on by his sister Pulcheria during his whole reign, notwithstanding the fact that the Huns under Attila exacted contributions of money and gifts. Pulcheria married Marcianus, who ruled from 450 to 457. This strong emperor refused to comply with Attila's demands. Leo the Thracian became the next emperor (457–74), and was succeeded by Zeno (474–91), after whose death Anastasius I (491–518), who married Zeno's widow, ascended the throne. The next emperor, Justin, was an Illyrian peasant, who had become an experienced soldier. He reigned from 518 to 527. By the conquests and able administration of the next emperor, Justinian the Great, the empire reached the acme of its prosperity and power. This great ruler endeavored to bring all under one state, one church and one law. He had the Roman law compiled and published under the form of a monumental code. After his death the empire began to decline. His successor, Justin II (565–78), desired to emulate the great Justinian and win even greater glory. But the Persian War exhausted his resources, while the Avars and Slavs made incursions on the northern borders and the Lombards overran Italy. Inefficient rulers succeeded: Tiberius Constantinus (578–82), Maurice (582–602) and Phocas (602–10). Heraclius ascended the throne in 610 and ruled till 641. By 628 he had restored the empire to its old supremacy. But the provinces had been crushed by the long wars, and when the Arabs began their conquests the emperors were too weak to oppose them successfully. Constans II (641–68) was an able ruler, as was his son Constantine (668–685), who fought bravely against the Mussulmans. But the reign of Justinian II (685–95 and 705–11) was disastrous. Leo the Isaurian (717–41) preserved the state. He defended Constantinople against the Saracens and reorganized the empire. Constantine Copronymus (741–75) was a great ruler and succeeded in enlarging the bounds of the empire. He planted colonies along the frontiers and encouraged commerce. The next ruler was Leo IV (775–80), who was succeeded by his son, Constantine (780–97), a boy of nine. His mother, Irene, was his guardian until he became of age, after which they ruled conjointly; but in 797 Irene had her son's eyes put out and deposed him, so that she ruled in his stead till 802. The next emperor, Nicephorus I (802–11) paid tribute to the Caliph Harun-al-Rashid, and later was killed by the Bulgarians. Leo the Armenian (813–20) defeated the latter and began a prosperous reign, but was murdered by conspirators. Under Michael (820–29) the Saracens conquered Crete. His son, Theophilus (829–42), was constantly fighting against the Caliphs. He was celebrated for his justice, and he won great renown for the magnificent edifices he erected. Constantinople was now the centre of European trade. Theophilus' son, Michael, was only four years of age when he ascended the throne. He later became a drunkard and was put to death at the instigation of Basil, who succeeded him (867–86). Basil was the first of the Macedonian line of emperors. From this time on the government was good, and the empire continued to be prosperous for three centuries. Basil himself was a man of great ability. His son, Leo the Wise (886–912) and his grandson, Constantine Porphyrogenitus (912–59), were authors of considerable ability. Romanus II (959–63), son of Constantine, reconquered Crete under the able generalship of Nicephorus Phocas, who married the sister of Romanus, and became emperor in 963, ruling in the name of his two stepsons until 969. The first of these was Basil II (963–1025) and the second Constantine VIII (963–1028). Basil defeated the Bulgarians and extended the boundaries of the empire further than any emperor since Justinian. On the death of Constantine VIII the husbands and creatures of his daughter Zoë ruled for 26 years. The next two years (1054–56) her sister, Theodora, who was virtuous and able, held the reins of government. Insignificant rulers were seated on the throne for the next 24 years. The Seljukian Turks had been rapidly conquering all the Asiatic possessions of the empire; and the next emperor, Alexius Comnenus (1081–1118) had to face also new dangers from the attacks of the Normans and the Crusaders. But the finances of the empire had been weakened by the growth of the Italian cities and the foundation of the kingdom of Jerusalem. Alexius was succeeded by John the Good (1118–43), who fought courageously against the Turks, Hungarians, Serbians and Armenians. Manuel Comnenus (1143–80) undertook many wars, but exhausted the resources of the empire; and the weak rulers, of the next 24 years brought it almost to ruin. Cyprus was soon lost, Bulgaria became independent and the Seljukian Turks menaced Constantinople. The Venetians were hostile and allied themselves with the Crusaders, who coveted the riches of the city. In 1204 Constantinople was captured, and the Latin empire established; but it lasted only until 1261, when Michael Palæologus of Nicæa drove out the Latins and re-established a Byzantine empire, though smaller than it was in 1204. The Palæologi were unable to strengthen the empire or increase its bounds. Michael VIII (1261–82) endeavored to win allies by offering to bring the Greek Church under the authority of the Pope. His son, Andronicus II (1282–1328), was a weak ruler, and civil war was rife at the close of his reign. Disaster followed disaster. The finances were in a hopeless condition, and from now on the emperors were incompetent. The command of the sea was lost, and the Ottoman Turks had already gained a foothold on the ruins of the Seljukian realm in Asia Minor. They conquered the provinces of the Byzantine empire one by one. Under John V (1341–91) the Turks gained their first foothold in Europe. They took Gallipoli in 1354. Manuel II (1391–1425) and John VIII (1425–28) were weak rulers and practically vassals of the Sultan. Constantine XI (1448–53) contended bravely against the Turks, but was unable to check the invaders and retain his capital — the only part of the empire left — and, finally, in 1453 Constantinople was captured by the Turks. This event marked the end of the Byzantine empire.

Of the 107 rulers from 395 to 1453, 20 were assassinated, 18 had their eyes put out, or were otherwise mutilated, 12 died in a monastery or prison, 12 abdicated, 3 died of starvation, 8 in battle, or as a result of accident. Vice and corruption reigned supreme in some periods; the people were servile and superstitious, the government despotic; yet the traditions and civilization of Old Rome were maintained. Frederic Harrison says: "First the Byzantine Empire preserved more of the tradition, civil and military organization, wealth, art and literature of the older Rome than existed elsewhere; and, secondly, in many essentials of civilization it was more modern than the nascent nations of the West.» The *Corpus* of Justinian continued to be the law of the Byzantine empire until the 9th century, when a new code was drawn up. Examples of Byzantine architecture can be found in every Mohammedan and Christian land. In the manufacture of mosaics, silks and embroidered satins, the Byzantine empire surpassed all others.

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BYZANTINE LITERATURE. Byzantine literature comprises the writings of the Greeks from Constantine the Great (324 A.D.) to the fall of the Byzantine empire (1453). The period, however, down to the time of Justinian (527) is generally regarded as belonging to the ancient Greek literature. The Byzantine literature does not so completely lack individuality as is commonly assumed, although it continues substantially the ancient Greek tradition and borrows antique forms. Being of a learned nature, it deals in large measure with the science of antiquity. Through excerpts, compilations, textbooks, scholia and lexica, the Byzantines preserved the knowledge of the ancient world. Even down to the 10th century men were keenly interested in antiquity, as, for example, Arethas and Photius in the 9th century and Emperor Constantinus VII Porphyrogenitus (945–59), who was himself a political and historical writer, and established commissions of scholars, who had compiled encyclopædias for the various sciences. To the same century belongs the great encyclopædic lexicon of Suidas. In the following centuries there came about a revival of classical studies, which were zealously prosecuted, thanks to the enthusiasm and activity of such men as Psellus (11th century), Tzetzes, Eustathius, Gregory of Corinth (12th century) and Planudes (14th century). With these scholars many Greeks associated themselves in uninterrupted succession: Theodorus of Gaza, Lascaris, Musurus, who introduced the epoch of «humanism» in the West. Christianity presented entirely new problems to Byzantine scholarship. Hence theological literature occupies by no means a small space in Byzantine literature. This is mainly a continuation of the tradition of the Church Fathers, but it also unites with ancient philosophy, and reaches its summit in the Aristotelian and theologian, John of Damascus (8th century), and in Psellus. After the 11th century theological literature was revised by the controversy with the «Latinists.» Fully developed also was the science of writing history, which dealt with universal history either in imitation of the manner of presentation or of the language of the ancient models. Special attention too was given to Church and to contemporaneous history. The former is represented by the «Chroniclers,» that is, the composers of world-chronicles, such as John Malalas (6th century), George Syncellus, Theophanes Nicephorus and George Monachus (8th century), John Scylizes (11th century), John Zonaras (12 century), Michael Glycas (12th century). In the foreground, however, stand the historians, who treat contemporaneous history, or merely a section of the history of the world. If we count, also, the historians of the 5th century (Eunapius, Zosimus, Priscus), who lived in a period really prior to the beginning of Byzantine literature, then we should reckon as the first of the early Byzantine time (to the death of Heraclius, 640), Procopius, Agathias, Petrus Patricius, Menander Protector, and Theophylactus. After the two following centuries, which mark a period of literary barrenness, we find in the 9th century a revival of literature, which manifests itself particularly in the manifold and varied historical activities of the patriarch Photius, and was further promoted by Constantine VII of the Macedonian house, and continued by historians such as Joseph Genesius and Leo Diaconus. With the many-sided Michael Psellos – statesman, philosopher, philologian and historian — begins in the 11th century another rise of Byzantine literature (Michael Attaliates among others), which reaches the summit in the 12th century in the historical works of Nicephorus Bryiennius, of Anna Comnena, John Cinnamus and Nicetas Acominatus. This period is also separated from the old development by the form of the language, for, while down to the 10th century concessions were made more and more to the spoken language, with the revival of classical studies in Byzantium the authors endeavored also to approach the antique form in the written speech; and so the gulf widened more and more between the language employed in books and that spoken by the people. Consequently, in the 12th century a reaction set in also against this current in the so-called «vulgar Greek» literature, which selected the popular language as its vehicle of expression (see GREEK LITERATURE). This branch of Byzantine literature confined itself, to be sure, to didactic and elegiac poems, epic and romantic verse and popular books. In the official literature also later, the archaizing form of speech held undisputed sway, for example, in the historians, especially in the polyhistors, George Acropolites and Pachymeres (13th century), Nicephorus Gregoras and Emperor John VI Cantacuzenus (14th century), Laonicus Chalcondyles and George Phranzes (15th century), who portray the downfall of the Byzantine and the establishment of the Turkish empire in Europe. The Greek authorship of the following centuries (down to the Greek revolution) must be looked upon as a branch of Byzantine literature, so far as it does not deal with the products of the popular language.

The poetry of the Byzantines has nothing of real importance to show except in the ecclesiastical field. Its chief representative is the composer of hymns, Romanus, who is supposed to have lived in the 6th century. After John of Damascus (author of Sacra Parallela) and Cosmas of Jerusalem (7th century) nothing important and individual was produced. In secular poetry the didactic and eulogistic play an important part, as, for example, in George Pisides (7th century). The sententious and epigrammatic poetry is represented by the poetess Casia (9th century), by John Geometres (10th century), Christopher of Mitylene and John Mauropus (11th century). The single drama of the whole period, *Christus Patiens* (11th or 12th century) scarcely deserves this designation, for it is merely a multitude of reminiscences from ancient Greek tragedy. Theodorus Prodromus (also called Ptochoprodromus, "Beggar Prodromus") showed a most remarkable activity and productivity, if the works that have come down to us under his name are the productions of one individual instead of several bearing the same name. He is the author of a long romance in verse, as well as satirical poems, eulogies and epigrams. In some of his works he makes use of the Bulgarian language and belongs consequently also to the earliest period of Bulgarian literature. The first collection of Byzantine historians, 'Historiæ Byzantinæ scriptores,' appeared in Paris (1648–1711, 39 vols., reprinted in Venice 1722ff. in 28 vols.). A new 'Corpus scriptorum historiæ Byzantinæ,' was published in Bonn (1828–97, 5 vols.) under the auspices of the Berlin Academy of Sciences, but is very unscholarly.

On the whole Byzantine literature is almost without originality, but is valuable for the historical material which it contains. Besides the authors already named we might mention Theodorus Prodromus, who wrote a long romance, in which the heroine is Rhodanthe and the hero Dosikles, Nicephorus Callistus of the 14th century, a writer on ecclesiastical history, John Doxopater of the 11th century, who wrote on rhetoric, and Michael Bellus, the younger, of the same century, who wrote historical and other works. See GREEK LITERATURE, and consult works there referred to.

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BYZANTIUM, bĭ-zăn'shĭ-ŭm, the name of the city of Constantinople before its name was changed by Constantine the Great. It was founded by a colony of Greeks from Megara, who, under a leader named Byzas, settled on what seemed a favorable spot at the entrance to the Thracian Bosporus, in 658 B.C. The city, which was built by the first colonists, was named after their leader. Other colonists followed from different quarters, especially from Miletus, and Byzantium was already a flourishing town when it was taken and sacked by the Persians, in the reign of Darius, the son of Hystaspes. After the retreat of the Persians (479 B.C.) Byzantium soon recovered itself. During the Peloponnesian War it acknowledged for some time the supremacy of the Athenians, but afterward fell away. Alcibiades recovered it for Athens (409), but it was taken by Lysander in 405. At a later period the Byzantines received support from Athens in their resistance against Philip of Macedon. The barbarian Thracians, who occupied the neighboring territory, and the Celts (Galatians), in their migrations to the East, often appeared to threaten the safety of the town; but in spite of this, chiefly owing to its favorable position for commerce, it continued to prosper, and survived the decay of most of the other Greek cities; and even under the Romans it was left free to manage its own affairs, and was allowed to demand dues from all ships passing through the Bosporus, only part of these being claimed by the Romans. At the end of the 2d century of the Christian era Byzantium, unfortunately for itself, sided with Pescennius Niger against Septimius Severus. By the latter it was besieged for three years, and when at last it was forced to surrender Severus ordered its walls to be razed to the ground, deprived the city of its privileges and placed it under the jurisdiction of the Perinthians. For a time the prosperity of the city was annihilated, until a new and more brilliant era began for it under Constantine the Great, after the defeat of Licinius in 330 A.D. Constantine made it the capital of the Roman empire, and changed its name to Constantinople (see CONSTANTINE; CONSTANTINOPLE). Its early form of government was that of an aristocracy, which passed into an oligarchy. In the year 390 B.C. it received from Thrasybulus a democratical constitution, closely resembling that of the Athenians. Byzantium was the great entrepôt for the grain trade between the countries bordering on the Black Sea and those bordering on the Ægean.

BYZANTIUM, Bank of. In the remotest historical times Byzantium was not only a city of commercial importance, it was the feeder to Ilion, Tyre and Carthage, and the port through which flowed not merely the envied products of the Orient, but also its science, its art and its delusions. It was the galleys of Byzantium that first bore the spices of India to the Ægean, its rich carpets and metallic wares to Tyre, its Hyperborean missionaries (*peripheres*) to Delos, its sacred hymn (the *maneros*) to Egypt, and its fame to Venice and Carthage. (Herodotus, Mel., 32, 36). The Byzantines engrossed the entire trade and prolific fisheries (*palamenes*) of the Pontic sea; levied tolls upon all vessels passing the Bosporus; and in their proud superiority, jeered at the Chalcedonians, who, after following them from Phrygia and arriving at the Bosporus too late to seize upon its commanding shore, had camped upon the arid point now known as Scutari. It is true that the Greeks claimed to have founded Byzantium; they also swore to their lineal descent from the "Eternal Gods"; but Grote has long since pricked these bubbles. Byzantium was in the possession of Cyrus, who died 520 B.C.; and the Ionian Greeks only captured it from the Persians in 478.

Byzantium was probably the most ancient city of the Levant, older than Colchis or Troy, and richer than Tyre or Sidon. To the former she afforded safe passage to adventurous Jason and vengeful Menelaus; to others, the commerce of the Mediterranean. Under whatever name — Byzantium, Nova Roma, Constantinople, Stamboul — she remained for 25 centuries the mistress of two seas; the arbiter and interpreter of two continents; the most inviting and most necessary location for the establishment and maintenance of an international bank, whose installation took place about 390 B.C., when she became an independent state and shook off the restraints imposed upon her industries and growth by the successive tyrannies of Babylon, Assyria, Persia and Greece.

At this period, shortly after the disastrous Peloponnesian War, Greece was much exhausted; its industries were prostrated, supplies annihilated, and the mines of Laurium, Thasus, Scapte-Hyle, Siphnos, Pangæus, etc., all shut down. Both gold and silver coins were hoarded. In 407 B.C. the Athenians were obliged to melt down the statue of Minerva Victoria and convert it into those base gold coins which Aristophanes satirizes in «The Frogs.» In time, even the base minæ were hoarded and gave way to the iron coins and parchment notes alluded to by Aristotle: the «shinplasters» and «wild cats» of a disturbed and suffering state. Prohibitions against exporting the precious metals had been followed by the usual evasions and these by the inevitable issuance of a fiduciary currency; something by which to trade; something by which to count.

When this makeshift currency was established in Athens the hoarded coins (chiefly silver drachmas) were furtively purchased by brokers, technically at risk of their lives, and sold to merchants with Oriental connections, who even in normal times profited so largely by this trade that now the shipment of silver to the Orient is said to have yielded, clear of all expenses, profits nearly cent per cent: a circumstance due to the superior value of silver as compared with gold, over and against the same relation in the Occident.

According to Boeckh, 772: «The money-changing business, which, if the iron coins were at that time in existence, must have been of special importance, was farmed in Byzantine to a single bank; and all persons were prohibited from buying or selling money elsewhere, under penalty of forfeiting the sums thus bought or sold.» As the Hellespont at that period (5th and 4th centuries B.C.) was the principal, almost the only channel through which flowed the trade to the Orient; the Bank of Byantium must have reaped very considerable advantages from this monopoly, even when, before the independence of the state, such monopoly may have been acquired through Athens: advantages that were doubtless enhanced when Byzantium recovered its entire liberty. But the «money-changing business» was not its only source of profit. The bank collected the Straits dues and farmed the customs; it financed the fisheries, by discounting the obligations of merchant adventurers who were obliged to provide ships, tackle and nets and yet run the risk of storms or a bad catch. The bank also accommodated the foreign merchants who came to buy or sell commodities in the adjacent fairs; of which a great number were held within a short distance of Byzantium, both in Greece, the Isles and «Syria,» a name, that according to Herodotus, went at that period for nearly all of Asia Minor west of the Halys.

Among the banking laws enacted while Byzantium was under the control of Athens were the following:

1. No banker shall demand (or receive) more interest money than that agreed upon at first. See «Banks, Ancient and Mediæval» for a similar provision in ancient India.

2. Nobody who had put in surety for anything may sue for it, he or his heirs. («Put in» is here probably meant for «pledged»).

3. Pledges and securities shall not stand but for one year.

4. Counterfeiters and debasers and diminishers of the current coin shall forfeit their lives.

5. No Athenian or sojourner shall lend money to be exported, unless for corn or some such commodity allowable by law. He who sends away money (out of the country), for other uses, shall be brought before the master of the custom house and prosecuted criminally, after the manner of those transporting corn unlawfully. He shall have no writ or warrant against his correspondent, nor shall the archons permit him to have a civil trial.

6. Corporations may make their own by-laws, provided that they are not inconsistent with the public laws (Potter, ‹Antiq. Græca,› II, 198–200).

The numismatic collections of Europe are so full of Byzantine coins of almost every period that they have given rise to numerous works and still more numerous contentions. Briefly, it may be stated that before the plunder of Persia and India by Alexander the Great, gold was valued in the coinages of the Greek states at 10 times that of the same weight of silver. After his soldiers were so laden with gold spoil that they rejected silver vessels and all other plunder less valuable than gold, and demanded to be led back to Greece because they could carry no more, their leader, in his capacity of King and Basileus, raised by decree the value of gold in his coinages to 12 times that of silver; and so it remained until Byzantium fell to the arms of Rome, and practically throughout the entire Roman domination down to the capture of Constantinople by the Latin forces in 1204, when the various kingdoms and principalities which arose upon the ruin of the empire struck their own coins and fixed their own valuation upon them.

The so-called «leather moneys» of Byzantium and of the various nations which throughout the Dark and Middle Ages issued fiduciary moneys were obligations written on parchment and attested by the proper authorities; of which moneys but a single specimen is known to exist at the present time, preserved in one of the great national cabinets of Europe. For the history of other ancient banks see Barcelona, Bank of; Fuggers, Bank of the; Genoa, Bank of; Medici, Banks of the; Tyre, Bank of; Venice, Bank of.

BZOVIUS, Abraham (Pol. *Bzowski*), Polish scholar and divine: b. Proszowice, near Miechow, 1567; d. Rome, 31 Jan. 1637. At the request of Pope Paul V, he spent several years of the latter part of his life in the Vatican, as librarian of the *Virginio dei Ursini*, and actively engaged in literary pursuits. He was a member of the order of the Dominicans, one of the most voluminous writers of his age, gained for himself a high reputation as professor of philosophy and theology at Milan and Bologna, and crowned the labors of his life by continuing the celebrated ecclesiastical annals of Cæsar Baronius, who had left them off at the year 1198, and completed only 12 volumes. Bzovius carried them to the year 1532, in nine volumes.

C

C the third character of the English alphabet and of all the alphabets derived from the Latin. In its present form it is a modification of the primitive Greek *gamma*. That primitive form was <, an angle with vertex pointing to the left; it is the reverse of the ancient Phœnician >, which points to the right, and of the Old Hebrew *gimel*, >. The Latin C (used also by the Greeks to some extent) is the ancient Greek < retained by the Greeks of Italy and rounded, just as the later Greek *gamma* symbol, Γ, is the angular symbol erected by the Eastern Greeks. The Russian alphabet retains the Greek symbol Γ, but its place is fourth, because in that alphabet the sign for the dentilabial V holds the third place. The Greek *gamma* (<, Γ,) seems to have always represented the same sonant guttural as the English *g* in «go.» In the Latin alphabet of the Romans, as represented in their earliest inscriptions, the C stood for the same sonant guttural as in the Greek, *g* hard; for example, *lecio*, later written *legio*; *macistratus*, later *magistratus*; yet at the same time the C represented also the surd guttural K, as it still does in English except before the vowels *e* and *i* and the diphthongs *æ* and *œ* in words from the Latin. Thus the early Latin alphabet was without the symbol K. There is in this use of the character C in ancient Roman epigraphy ground for the inference that the early Romans confounded the two gutturals *k* and *g* hard, as in some localities or in some classes of people the termination *ing* becomes *ink*, and «something» becomes «somethink.» But at a later period the distinction between *g* hard and *k* was recognized, and then for the designation of the mute guttural the *kappa* (K) of the Greek alphabet came into use in Latin writing. But the *k* was afterward rejected, and its only use in Latin was in writing the word *Kalendæ* (abbreviated to *kal.* or *k.*) and as an abbreviation of *Carthago* (Carthage) and of the personal name *Cæso*. No doubt the persistence of *k* in *kalendæ* was due to the adherence of the Pontifices to the antique forms of the official calendars; and the K standing for the forename Cæso was retained as a means of abbreviating that name and distinguishing it from the abbreviation of the name Caius: C. Julius Cæsar is Gaius, but K. Fabius Ambustus is Cæso. But the *k* having been discarded from the Latin alphabet, its function was assigned to the symbol C, while for representation of the sonant guttural a modified form of C was adopted, namely, the G with the value of *g* in «go.» The soft *g*, equal to *j*, was probably unknown to the Romans before the general debasement of the Latin language. After the symbol *k* had been discarded and been superseded by C, the symbol C, with the power of *gamma*, was retained as an initial abbreviation of Gaius, name for a man, and of Gaia (with C reversed Ɔ), the name of a woman. C was also retained in the formula Cn. as an abbreviation of Gnæus. This use of the initial C as representing *g* hard (sonant guttural) recalls the primitive equivalence for the Romans of the two gutturals *k* and *g* hard; but the modern Latinists, unacquainted with such use of C, have usually pronounced Gaius «Kaius» and Cnæus «Knæus,» instead of «Gæus» and «Gnæus.» In the Anglo-Saxon, its alphabet having been derived from the Latin, the C had everywhere the value of K, and the same is to be said of the Gælic; that fact gives presumptive proof that at the first contact of the Gælic and Germanic races with men of Latin speech the C in all situations was equivalent to *k* in Latin; and the German word Kaiser is proof that when the Germans first heard of Julius and the Cæsars who succeeded him the head of the Roman state was «*Kaisar*,» not «*Cæsar.*» The change in the pronunciation of C from *k* to *s*, as in French and English, to *ch* as in Italian, to *ts* as in German, appears to have come about after the fall of the Roman empire.

In Anglo-Saxon the original Germanic K sound of C undergoes palatalization, ending in the English ch; cf. Germanic *kerl*, A. S. *ceorl*, English *churl*. In some cases a word is transferred into English from Scandinavian or a non-palatalizing dialect, giving us a k-sound and a ch-sound side by side; cf. *churl* and *carle*, *cheap* and *coper*, *church* and *kirk*. In words of true Indo-European descent, English C corresponds to original g, as Eng. *tug*, Lat. *duco*. To a primitive C, h corresponds in English, as Gr. *κύων*, Lat. *canis*, Eng. *hound*. There is no q in Anglo-Saxon and Old English, so *cwæð* is written for the modern *quoth*. Similarly, *cyning* is written for *king*.

As an abbreviation, C stands for a musical note, for Centigrade, for 100, for the name Gaius. c. stands for cent, for centime, for *circa* (about). Cn. stands for the name Gnaius. B. C. stands for before Christ.

C. G. S., or **CENTIMETER-GRAM-SECOND.** See Metric System, The.

ÇA IRA, sä ē-ra̤, a popular song of the great French Revolution. The origin and date of this song are both uncertain, and there are various versions of the words claiming to be original. The words are generally supposed to have been written by Ladre, a street singer, and the melody was originally a popular carillon by Bécourt, and a favorite air of Marie Antoinette. In all probability it dates from May or June

1790. French writers say that Benjamin Franklin, in speaking of the American Revolution, frequently used the expression «Ça ira» («it will succeed»). The French republicans caught up the phrase, and «consecrated» it to their own revolution in a popular hymn. The refrain of one version runs thus:—

> "Ah ! ça ira, ça ira, ça ira,
> En dépit d' l'aristocrat' et d' la pluie,
> Ah ! ça ira, etc.
> Nous nous mouillerons, mais ça finira,"

referring to the rain which fell during the taking of the Bastile. In 1797 the song was banned by the Directory.

CAABA. See Kaaba.

CAAING-WHALE, one of several species of porpoise-like cetaceans of the Killer family (*Orcidæ*), characterized by its globose head; properly *Globiocephalus melas,* of the north Atlantic Ocean. It is from 16 to 24 feet long, 10 feet in diameter at its thickest part and weighs between 5,000 and 6,000 pounds. Its pectoral fins are about 5 feet long and 18 inches broad, and its dorsal fin is very low. With the exception of a white streak, which begins in the form of a heart under the throat and gradually narrows to the vent, the whole of the body is of a glossy black color, and hence the fish is frequently known as the blackfish (q.v.) or black dolphin. The teeth are arranged at considerable distances in the upper and under jaw in such a manner that those of the upper jaw fit into the spaces left in the lower jaw, and conversely. Their number is very variable. They are conical in shape, strong, rather long, and end in a point which is a little curved backward and inward. The caaing-whale is very abundant and very widely distributed. It is found in the whole of the Arctic Ocean, and also in the German, Atlantic and Pacific oceans, and even in the Mediterranean Sea. It is remarkable for its gregarious habits, being often found in schools numbering several hundreds, which are led by an old and experienced male whom, it is said, they never abandon. On this account its pursuers always endeavor to force the leader on shore, and when this is accomplished all the rest follow him and are likewise stranded — hence the Scotch name «caaing,» equivalent to «driving.» In the stomachs of these animals are usually found the remains of cod-fish and various species of cuttle-fish, as well as of herrings, ling and other fishes. The caaing-whale is pursued chiefly on account of its oil. See Whale.

CAAMA, kä'ma. See Hartbeest.

CAB, a carriage with two or four wheels, usually drawn by one horse, and plying for hire; a hackney-carriage. One well-known two-wheeled variety is the hansom named after the inventor. Public cabriolets — hooded chaises carrying one person besides the driver — were introduced in London in 1823, and the name was soon after shortened to cab. See Coach; Hackney-Carriage.

CABAL, an English ministry under Charles II (1667–73), composed of Clifford, Ashley, Buckingham, Arlington and Lauderdale, the initials of whose names form this word, whence perhaps its use as a designation. But the use of this word to signify a body of intriguers was not originally derived from this circumstance, as sometimes supposed, for the word cabale, derived from cabala (q.v.), was used in that sense in French before this time.

CABALA, or **CABBALA.** See Jews and Judaism — The Cabala.

CABALLERO, Fernán, fĕr-nän' kä-bạ-lyā'rō, pseudonym of Cecilia Böhl von Faber, Spanish novelist, daughter of a German who settled in Spain and married a Spanish lady: b. Morges, near Lausanne, Switzerland, 25 Dec. 1796; d. Seville, 7 April 1877. Brought up in Germany, she went to Cadiz with her father in 1813. She was a polyglot writer, publishing works in Spanish, German and French. Her first novel, ‘La Gaviota,’ appeared in 1849, and was followed by ‘Elia,’ ‘Clemencia,’ ‘La Familia de Alvareda,’ etc., as well as by many shorter stories. In 1859 she published a collection of folk-tales under the title, ‘Cuentas y poesias populares andaluces.’ Some of her works have appeared in English translations, including ‘La Gaviota’ (translated as ‘The Sea-Gull,’ 1867); ‘Elia: or Spain Fifty Years Ago’ (1868); ‘Air-Built Castles’; and ‘The Bird of Truth’ (1881). The chief charm of her writings lies in her descriptions of life and nature in Andalusia. She was three times left a widow; her last husband was a lawyer named Antonio Arron de Ayala. Of late it has been discovered that she was a very excellent letter writer, and critics who have examined her correspondence with Antoine de Latour name her the Madame de Sévigné of Spanish literature. She forms the subject of one of the ‘Six Life Studies’ (1880) of M. B. Edwards. Her ‘Obras Completas’ were published in 18 volumes (Madrid 1855–67), and have since been reprinted in the ‘Colección de escritores castellanos.’ Consult de Latour, A., ‘Etudes littéraires sur l'Espagne contemporaine’ (Paris 1864); and ‘Espagne, traditions, mœurs et littérature’ (Paris 1869); De Gabriel y Ruiz de Apodaca, F., ‘Últimas producciones de Fernán Caballero,’ with a biography (Seville 1878); José Maria Ausensio, ‘Fernán Caballero y la novela contemporánea’ (Madrid 1893); Morel-Fatio, A., ‘Fernán Caballero d'après sa correspondence avec Antoine de Latour’ (in the *Bulletin Hispanique,* Vol. III, Bordeaux 1901), reproduced in his ‘Etudes sur L'Espagne, 3e série’ (Paris 1904); Pitollet, ‘Les premiers essais de Fernán Caballero’ (Paris 1908); Coloma, ‘Recuerdos de Fernán Caballero’ (Bilbao 1910). See La Familia de Alvareda.

CABANEL, kä-ba-nĕl, **Alexandre,** French artist: b. Montpellier, 28 Sept. 1823; d. Paris, 23 Jan. 1889. He studied with Picot, and after 1860 gave himself mainly to portrait painting. He was for many years a professor of the Académie des Beaux Arts and was especially popular with American patrons. Among his many portraits of Americans is that of Miss Catherine Wolfe, now in the Metropolitan Museum, New York, which contains also his ‘Queen Vashti and King Ahasuerus,’ and ‘Birth of Venus.’ See Stranahan, ‘A History of French Painting’ (1899).

CABANIS, kä-bạ-nēs, **Jean Louis,** German ornithologist: b. Berlin 1816; d. 1906. He made an ornithological tour through North and South Carolina, 1839–41, and in 1849 became custodian of the ornithological department of the Berlin Zoological Museum. His investigations were largely instrumental in establishing a natural classification, and were published in Wiegmann's 'Archiv für Naturgeschichte' (1847), and in the 'Museum Heineanum' (1850–63). Cabanis founded the *Journal für Ornithologie* in 1853, and continued to edit it for 40 years. He was a most prolific writer, his contributions to ornithology reaching a total of 400 and embracing the birds of all countries.

CABANIS, Pierre Jean George, French physician and philosopher: b. Cosnac, department of Charente-Inférieure, 5 June 1757; d. Rueil, near Paris, 5 May 1808. In his 16th year he went to Warsaw as secretary of a Polish lord, where the proceedings of the stormy Diet of 1773 filled him with melancholy and contempt of mankind. He began at Paris a complete translation of the 'Iliad'; became acquainted with Madame Helvetius, and through her with Holbach, Franklin and Jefferson, and became the friend of Condillac, Turgot and Thomas. In his 'Serment d'un Médecin' he formally took leave of the *belles-lettres.* He was a leader in the reformation and reorganization of French medical schools and taught in several. He professed the principles of the Revolution, and was intimately connected with Mirabeau, and made use of his ideas, and obtained from him the work on public education which Cabanis published himself in 1791, after the death of Mirabeau. He lived in still closer intimacy with Condorcet. At the time of his death he was a member of the Senate. His 'Rapports du physique et du moral de l'homme,' edited by Peisse (Paris 1844), is his most important work. It displays considerable power of analysis, and advocates the most extreme materialistic doctrines. Consult Dubois, 'Examen des doctrines de Cabanis' (2 vols., Paris 1842); Labrousse, F., 'Quelques notes sur Cabanis' (Paris 1903).

CABARET, kä-bär-ā', derived from the French, signifying inn or restaurant, a term generally applied in the United States since 1910 to the dinners, suppers or meals, the dansants or tea dances served in hotels and popular restaurants to the accompaniment of singing, instrumental music and dancing. It is an elaboration of the imported *café chantant* of Paris which provided vaudeville entertainment during meals.

CABAT, kä-bä, **Nicolas Louis,** French artist: b. Paris, 1812; d. 1893. He studied with Flers and became prominent among painters of the landscape realistic school. Among his works are 'Pond at Ville d'Avray' (1834); 'A Spring in the Wood' (1864), and 'A Morning in the Park of Magnet' (1877).

CABBAGE, a biennial plant, too well known to need description, and constituting one of the most valuable classes of vegetables. The *Brassica oleracea,* the original species from which the numerous varieties of cultivated cabbages are derived, although in a wild state very remote in appearance from the full, round head which our plants present, is scarcely more so than the kale, cauliflower, broccoli, etc., all of which belong to the same family. There are two general classes of cabbage, smooth-leaved and wrinkle-leaved. The smooth-leaved are either red or green and the head conical, oblong, round or flat. The principal varieties are known to have existed at least as far back as the 16th century, but minor varieties are being constantly produced by selection and intercrossing. The parent stock is of highly vegetable character, as its habitat and habit alike show; and placed in more favorable conditions, its growth becomes luxuriant. More normally it is carried back into the stem, and this may accordingly become swollen and turnip-like, in which case we have the kohl-rabi, of which an extreme subterranean and almost turnip-like variety has also arisen; or it may be, as in the Jersey cabbage, largely applied to the purpose of the growth of the stem, which may reach a height of 8 to 10 feet, and furnish not only walking-sticks, but even spars for small thatched roofs, etc. The vegetative overplus may, however, also be applied to the formation of buds, which accordingly develop with peculiar exuberance, giving us Brussels sprouts. The most evolved and final variety is the cauliflower, in which the vegetative surplus becomes poured into the flowering head, of which the flower is more or less checked; the inflorescence becoming a dense corymb instead of an open panicle, and the majority of the flowers aborting, so as to become incapable of producing seed. Let a specially vegetative cabbage repeat the excessive development of its leaf parenchyma, and we have the wrinkled and blistered savoy. Again a specially vegetative cauliflower gives us an easily grown and hardy winter variety, bróccoli, from which, and not from the ordinary cauliflower, a sprouting variety arises in turn.

The common cabbage is by far the most valuable to both man and beast. It is also the most productive; for it is believed that an acre of ground will yield a greater weight of green vegetable matter (and thus be more profitable to the farmer) in the shape of cabbage than in that of any other vegetable whatever. It is very abundantly produced by clay soils which are unfit for turnips, and the farmers who cultivate such soils will find it a vegetable worthy of much attention. The cabbage furnishes green fodder for cows and sheep, which is at least as good as turnips or carrots, fattening the animals equally fast, and rendering their milk, butter, etc., to the full as sweet, and is far preferable, as it keeps later in the spring, and thus supplies green food when no other can be procured. It is eaten by men in three forms, all of which have their admirers, but which vary much in respect to their wholesomeness and digestibility. These forms are sliced raw, plain-boiled and salted cabbage or sauerkraut (q.v.), the favorite dish of the German nation. Raw cabbage, sliced fine and eaten with vinegar, either cold, or hot enough merely to wilt the vegetable, is one of the lightest and most wholesome articles of vegetable food, and in this shape will supply a green summer vegetable through the whole of the winter. Its use cannot be too highly recommended. Boiled cabbage takes longer to digest and is more trying to a weak stomach.

Cultivation.—The cabbage being biennial, the main crop must be sown the autumn previous to that in which it is to be reaped. Field cabbages and the drum-head varieties that are used in gardens, being late in character, may be sown in July, or from the third week of that month to the second week in August. But the smaller and earlier sorts used in gardens should not be sown before the first week of August, nor later than the second week of that month. If the plants are reared earlier, they are apt to run to seed the following spring; and if, on the other hand, they are reared later, they will not acquire strength enough to withstand the cold of winter before it comes upon them. For successive crops to be used in the shape of young summer cabbages, one or two sowings may be made from the beginning of March to the beginning of April. Autumn-sown plants may be planted out in rows permanently, as soon as they are strong enough. Additional plantations from the same sowing may be made in spring, to be followed by others, made at intervals, up till July, from spring-sown plants. Thus a close succession of usable cabbages may be obtained the year round. In the northern parts of the United States cabbages for the early summer market are sown about September, kept under glass or frames during winter and planted out in spring. For later markets the seed is sown in beds as early as possible in spring (about March), and transplanted later. Cabbages are sometimes preserved for winter by inverting them and burying them in the ground. Cabbage coleworts may be obtained from any good early variety of cabbage. They are simply cabbages which are not permitted to form hearts, but are used while the leaves are yet green and the hearts more or less open. Three sowings should be made for the rearing of these: the first about the middle of June, the second about the same time in July, and the third about the last week of the latter month, or the first week of August. These sowings will provide crops of green cabbages from October till March or April, if the winter is not destructive, after which they begin to run to seed.

CABBAGE-BARK. See ANDIRA.

CABBAGE-BUG. See CABBAGE-INSECTS.

CABBAGE-BUTTERFLY, a name given to several species of butterfly, which deposit their eggs on cabbage-leaves, hence called *Brassicariæ*; for example, *Pieris brassicæ*.

CABBAGE-FLY, a species of insect (*Anthomyia brassicæ*) of the same family (*Muscidæ*) as the house-fly, larvæ of which prey upon the roots of cabbages, and to the same genus as the turnip-fly and the potato-fly. The *Anthomyiæ* deposit their eggs in the earth, and the different species receive different names according to the particular roots upon which the larvæ feed, in which they produce disease.

CABBAGE-INSECTS, certain insects injurious to the cabbage, some of which also prey on the radish. The harlequin cabbage-bug (*Murgantia histrionica*) destroys in the Southern States, by its punctures, cabbages, turnips, radishes, mustard, etc. It is a black and orange-colored bug. The newly-hatched insect is pale green marked with black, but with successive molts takes on certain orange markings. The eggs hatch on the third or fourth day after laying, and the young bugs go through all their molts and are ready for reproduction in about two weeks. There are many generations in the course of the summer; and on the advent of winter the adult insects crawl under rubbish to hibernate. The earliest specimens in the spring congregate upon mustard and early radishes, flying later to cabbages. The very young, as well as the old, combine to destroy the plant, which wilts as if poisoned. The insect is very difficult to kill, so that destruction of the overwintering individual is the important point to be striven for. Diluted kerosene emulsion must be applied, not too strong to ruin cabbages. The caterpillar of the cabbage-moth (*Pieris rapæ*) and its congeners prey on cabbage and turnip leaves. Cabbages are more or less injured by the web-moth (*Plutella xylostella*), the zebra caterpillar (*Mamestra picta*), the cabbage root fly (*Phorbia brassicæ*), the cabbage-weevil (*Otiorhynchus picipes*), the cabbage aphis (*Aphis brassicæ*), etc. All these can best be destroyed by the use of pyrethrum, or dilute kerosene emulsion or salt. The larvæ or eggs or infected leaves should be destroyed.

CABBAGE-MOTH. See CABBAGE-INSECTS.

CABBAGE-PALM, a name given to various species of the palm-tree, from the circumstance that the terminal bud, which is of great size, is edible and resembles cabbage, as the *Oreodoxa oleracea,* a native of the West Indies, the simple unbranched stem of which grows to a height of 150 or even 200 feet. It is crowned by a head of large pinnate leaves. The flowers are placed on a branching spadix and protected by a double spathe. The unopened bud of young leaves is much prized as a vegetable, but the removal of it completely destroys the tree, as it is unable to produce lateral buds. *Ptychosperma elegans* is the cabbage-palm of New South Wales. The name is also given to species of *Euterpe,* and to *Sabal palmetto,* a Florida palm.

CABBAGE-ROSE, a species of rose (*Rosa centifolia*) of many varieties, supposed to have been cultivated from ancient times, and eminently fitted, from its fragrance, for the manufacture of rose-water and attar. It has a large, rounded and compact flower. It is called also Provence (or more correctly Provins) rose, from a town in the French department of Seine-et-Marne, where it is much cultivated.

CABBAGE-TREE, a name given to the cabbage-palm, and also to a tree of the genus *Andira* (q.v.).

CABEIRI, kă-bī'rī, or **CABIRI,** heroes or divinities, venerated by the ancients in Samothrace, Lemnos, and in different parts of the coasts of Greece, Phœnicia and Asia Minor, as the authors of religion and the founders of the human race. The multiplicity of names applied to the same character, the interchange of the names of the divinities themselves with those of their priests, the oracular law which enjoined the preservation of ancient barbaric names, and thus led to a double nomenclature, sacred and profane, together with the profound secrecy of the rites, have involved the subject in great obscurity. Some have thought that the Eastern mythology and the Druidism of western Europe contain traces of the Cabeiri. Some say there were six, three male and three female, children of Vulcan and Cabira, daughter of Proteus. Others make two sons of Jupiter or Bacchus. In Samothrace four were venerated. Recent excavations near Thebes have brought to light much information on the cult of the Cabeiri, one of whom has been identified with Demeter. The mysteries celebrated there, in the obscurity of night, were the most famous. Consult Lobeck, ‘Aglaophamus’ (Königsberg 1829); Schömann, ‘Griechische Altertümer’ (Vol. II, Berlin 1894); Preller, ‘Griechische Mythologie’ (Vol. I, Berlin 1894); Welcker, ‘Griechische Götterlehre’ (Vols. I and III, Göttingen 1857–62); Lenormant, in Daremberg and Saglio, ‘Dictionnaire des antiquités’ (Vol. I, Paris 1892); Rubensohn, O., ‘Die Mysterienheiligtümer in Eleusis und Samothrake’ (1892); Robinson, ‘Greek Inscriptions from Sardis’ (in *American Journal of Archæology*, 2d series, 17, 1913; 365, for etymology).

CABELL, William, American statesman: b. Licking Hole, Va., 13 March 1730; d. Union Hill, Va., 23 March 1798. He was a member of the House of Burgesses of Virginia upon the outbreak of the Revolution; took an active part in the affairs of the new nation, and before the adoption of the Federal constitution was presiding magistrate for the United States in Virginia.

CABELLO. See PORTO CABELLO.

CABER, the undressed stem of a tree, 20 or more feet long, used for trial of strength in Scottish athletic games. It is held upright against the chest, by the smaller end, and tossed so as to strike the ground with the heavier end and turn over. The contestant making the farthest toss with the straightest fall is winner.

CABES, kä'bĕs, or **GABES**, Africa, a town and port of the French protectorate of Tunis. It stands at the foot of the Jebel Hamarra, on the right bank of the Wad-er-rif, near the head of the Gulf of Cabes, and may be said to consist of several villages. It contains an Arabic school, a French garrison and is the seat of the governor of the province. It has some export trade in dates, henna, etc. The Gulf of Cabes (Syrtis Minor) has at its entrance the islands of Kerkenna and Jerba. Its chief seaport is Sfax. Pop. of Cabes, 20,000.

CABESTAING, ka'bĕs-tăn', Guillaume de, Provençal poet and knight: d. about 1213. According to Boccaccio in the ninth tale of the fourth day of the ‘Decameron,’ Cabestaing was the victim in the legend of the “eaten heart,” which originated in Oriental literature, and is also told of Châtelain de Coucy, a French troubadour, and of Reinmann von Brennenberg, a German minnesinger. In 1212 Cabestaing fought in the famous Christian victory over the Moors at Las Navas. He loved and was beloved of Marguerite, wife of Raymond of Château-Roussillon. In jealousy the husband murdered the poet-knight, tore out his heart, had it cooked and served in a meal to his wife. When he told her, she replied “Since I have eaten such noble food, I shall never eat any other,” and leaping from a balcony, killed herself. A selection of Cabestaing's verse is found in Raynouard's collection.

CABET, kä'-bā', **Étienne**, French communist: b. Dijon, 2 Jan. 1788; d. Saint Louis Mo., 9 Nov. 1856. He was brought up for the bar, and was appointed attorney-general of Corsica, from which office, however, he was soon dismissed. He was sent to the Chamber of Deputies in July 1831, and there made himself so obnoxious to the government by his violent speeches, and at the same time by his inflammatory pamphlets and a journal entitled *La Populaire*, that he was indicted for treason, and rather than subject himself to the imprisonment to which he was sentenced, withdrew for five years to England. While there he published the ‘Voyages et aventures de lord Carisdall en Icarie,’ in which he elaborated his scheme of communism, which from 1842 to 1848 passed through five editions. He began again to publish *La Populaire* in 1841, and circulated it widely among the working classes. He also issued an Icarian almanac, several pamphlets and a work on Christianity, which would restore social equality as taught by the early Christians and opposes modern ecclesiasticism. He also wrote a history of the French Revolution from 1789 to 1830 which appeared in five volumes. On 2 Feb. 1848, a band of Icarians left France for the Red River in Texas, where Cabet had secured a tract of 400,000 acres of land, the free use of which was open to the settlers, under condition that before their departure they should deposit all their funds in the hands of Cabet, who assumed the financial and general control of the expedition. But the expedition turned out badly, and lawsuits were instituted against Cabet; and on 30 Sept. 1849, after he had left France for Texas, he was found guilty by default of swindling his disciples, and sentenced to two years' imprisonment. Meanwhile, with his colony of Icarians much reduced in number, he took up his abode at Nauvoo, on the Mississippi, in May 1850, and soon after returned to Paris. There, after a protracted trial, his innocence was fully established, 26 July 1851, by the Court of Appeal, and the judgment against him canceled. He returned to Nauvoo, where he continued to preside over his colony but many disappointments and cares embittered his life and accelerated his death. In justice to Cabet it should be said that the highest moral tone prevailed in Nauvoo, and whatever may be the politico-economical objections to his system, the colony presented, as far as the conduct of the settlers was concerned, a model of purity and industry. Consult Shaw, ‘Icaria: A Study in Communistic History’ (New York 1884); Lux, ‘Etienne Cabet und der ikarische Communisimus’ (Stuttgart 1897); Prudhommeaux, ‘Icarie et son fondateur, E. Cabet’ (Paris 1907).

CABEZA DE VACA, kä-bā'thą dā vä'ka, Alvar Nuñez, Spanish explorer: b. Jerez de la Frontera 1490; d. about 1564. He was second in command in the ill-fated expedition of Pánfilo de Narvaez to Florida in 1528. After the loss of their commander, Cabeza de Vaca, with a few survivors, landed west of the mouth of the Mississippi, and after eight years of wandering and captivity among the Indians reached a Spanish colony on the Pacific. He returned to Spain, and in 1540 was appointed governor of La Plata. He explored Paraguay, but became unpopular with the colonists, and after a defeat by the Indians was arrested on the charge of one of his subordinates, returned to Spain (1544), found guilty and banished to Africa. Eight years later he was pardoned and made judge of the Supreme Court at Seville. He has left an account of his travels and explorations in ‘Relacion de los naufragios y comentarios' in the 'Colección de libros y documentos referentes à la historia de América' (Vols. VI and VII, Madrid 1906). An English translation by Buckingham Smith of the North American story is found in J. F. Jameson, 'Original Narratives of Early American History' (Vol. II, New York 1907), and in Fanny Baudelier, 'Journey of Alvar Núñez Cabeza de Vaca' (id. 1905). The South American account was translated by L. L. Dominguez for the *Hakluyt Society Publications* (Vol. LXXXI, London 1891). Consult Fernandez de Oviedo, G., 'Historia general y natural de las Indias' (Madrid 1853); Bancroft, H. H., 'History of North American States and Texas' (San Francisco 1884); *Texas State Historical Association Quarterly* (Vols. I, II, III, IV, X, Austin 1897–1907); Lowery, W., 'Spanish Settlements within the Present Limits of the United States 1513–61' (New York 1901).

CABEZON (Sp. "big head"), a name applied to three or four distinct fishes. 1. *Larimus breviceps,* occurring in seas from the West Indies to Brazil, and belonging to the family of croakers, or *Sciænidæ.* It reaches a length of 10 inches. 2. *Scorpænichthys marmoratus,* a member of the *Cottidæ,* or sculpins. It is found from Puget Sound to San Diego, reaches a length of 30 inches, and is a common food-fish, but its flesh is coarse and tough. 3. The smooth cabezon (*Leptocottus armatus*), also a sculpin of the Pacific coast. 4. *Porichthys notatus,* a member of the *Batrachoididæ,* found from Puget Sound to Lower California, which reaches a length of 15 inches and is sometimes called "singing-fish."

CABILLONUM. See Châlon-sur-Saône.

CABINDA, ka̤-bēn'da̤, or **KABINDA,** Portuguese West Africa (also called Angola), a seaport town north of the Kongo River in lat. 5° 30' S. It is the most important place in that portion of Angola separated from French Kongo by the boundaries assigned by treaty of 12 May 1886, and from the Belgian Kongo by those prescribed 25 May 1891. Its trade is chiefly in such products of the region as sugar, coffee, cocoanuts and vegetable oils. Number of inhabitants about 10,000.

CABINET AND CABINET GOVERNMENT. The word cabinet was originally applied to the small chambers, closets or private apartments in which sovereigns, ministers and other high officials consulted their trusted advisers. In modern times, where used in connection with governmental affairs, the word is a collective name applied to the leading officers of state in a number of constitutional governments who act as a body of advisers to the head of the state and in some countries as the chief executive council and controller of legislation as well. While usually confined to the ministers or department heads of a constitutional government, there is no reason why the term should not be applied also to the chosen advisers of an absolute monarch.

Status and Functions of Foreign Cabinets.— Cabinets are widely divergent in their powers and functions. That of England, which is the earliest cabinet, is the direct antithesis of the President's Cabinet in the United States, which is the next oldest, though the two cabinets are similar in this respect, that they are composed entirely (save on rare occasions) of members of the dominant political party, selected by the actual head of the state. The constitutional governments of Europe, the self-governing British colonies and Japan have completely or imperfectly accepted and applied the British type, while Switzerland and the Latin-American republics have patterned theirs after that of the United States. France, which has completely accepted the theory of Cabinet government, is the most important republic which has an actual Cabinet government in its modern highly developed form. Cabinets based on the British type may be loosely described as executive committees of the legislative bodies, in which their members have seats, before which they expound and defend the legislative measures they prepare, and to which they are directly responsible — in fact, they are "the government." The Cabinet must not be confused with the ministry. All members of the Cabinet are of the ministry — of the members of the Commons and Lords who hold office under the government and who retire from office when the government goes out of power, but all members of the ministry are not of the Cabinet. Members of the ministry must support the policies adopted by the Cabinet — vote with the government as regularly as Cabinet ministers — but they have no voice in determining these policies. See Great Britain — Crown and Cabinet; Italy — Political Administration and Crown and Parliament.

The British Cabinet, a shortened name for "cabinet council" — that is, a council held in the King's cabinet, or private room — gained its name under Charles I, between 1630–40, when it was ostensibly a committee of the privy council to expedite business, but in reality a few of the King's favorites. The sovereign presided at its deliberations, and it was not until George I ascended the throne (1714) — this King being unable to speak the English language — that it became the practice for the monarch no longer to preside over its meetings. But the kings did not give up their control over the power of appointing the great officers of state without a long and bitter struggle; and it was not till George III's insanity loosened his hand that effective control by ministers can be said to have won the final victory. Even then, and during the early 19th century, its unity had by no means become so rigid as now; during the latter period many instances occurred of Cabinet members opposing the measures of the majority, and even of the Premier, and still retaining their portfolios. But by the 'thirties it had pretty much settled into its present constitution and rules. An important change was made in 1782, just after the American Revolution, when its honorary members were dropped, and the membership confined to "efficient" members,— officers of state so important that they cannot be excluded from it, or personalities so powerful that moribund offices are kept constructively alive to make place for them. There is no absolute limit to the number of members, but custom dictates not less than 11, and the necessity of coming to some agreement and transacting business prohibits its being much in excess of 15. The Asquith Coalition Cabinet of 1915 contained 22 members. As the Premier's duties are of a general character, it is unusual under modern conditions that he assume control over a department, and he generally takes the office of First Lord of the Treasury, which is practically a sinecure. There are also the four other chief secretaries of state — for war, for home affairs, for the colonies and for India; the Chancellor of the Exchequer, the First Lord of the Admiralty, the Lord Privy Seal, the Lord President of the Privy Council, the Lord Chancellor, and the Chief Secretary for Ireland. The last-named may or may not be included; and the heads of other departments may find places if desired. The Prime Minister is the head of the Cabinet; he selects his ministers, enforces harmony and concert of action among them, and by retiring, whether voluntarily or not, renders imperative their resignation. He presides at all Cabinet meetings (the deliberations of which are secret) but has no legal control over that body or its individual members. Besides being Premier, he may hold one or more governmental offices. The ministers are usually men of affairs, successful politicians and able debaters. If they cannot defend the government's policy on the floor of the legislative body, the ministry may be turned out, and practical incapacity may render all defense of no avail. The defection of a Cabinet minister not only involves his retirement from the Cabinet but also from the office held by him. All ministers have the right to appear in the legislative chamber and to discuss measures under consideration; they introduce most of the important legislative proposals and also quite effectually control the proposals of private members by making them questions of confidence in the government or ministry. While ministers are present on the floors of the legislative chambers the entire policy and administration of the Cabinet may be subjected to the most searching review by means of parliamentary questions and interpellations put to the ministers in open session. (See GREAT BRITAIN — PARLIAMENT; FRANCE — GOVERNMENT). In some of the countries which have followed the United States form of government the Cabinet members are granted a seat in the legislature for purposes of government, if not of voting. In the Cabinet system the head of the state in whose name all acts of government are performed is legally irresponsible, the responsibility for such acts being assumed by the ministers who countersign or otherwise attest their approval of such acts. The Cabinet's responsibility for all governmental acts is enforced by the legislative body by means of votes of censure or of lack of confidence or by defeating the legislative measures or program advocated by the ministry. In the event of an adverse vote on their proposals the Cabinet must either resign or dissolve the existing legislature and appeal to the electorate at a new election. The responsibility is collective and the ministry stands or falls as a body or unit. But in England the fate of the Cabinet can only be affected by the censure of the House of Commons; the censure of the Lords can have no adverse effect.

Hence in governments patterned after the British system the Cabinet is the dominant power in the state and renders wholly impossible the separation of powers, which forms the basic principle of constitutional government.

The American Cabinet, or «President's Cabinet,» has, of course, grown with the growth of the departments. There were but four Cabinet officers at the outset, the Secretaries of State, of War and of the Treasury, with the Attorney-General. Of these, following the English tradition, in which from necessity foreign affairs had held the highest place, the secretaryship of state was regarded as the most important and honorable, and its incumbent was considered to be in the line of succession for the Presidency, as for several administrations proved to be the case. John Quincy Adams was the last of these, and he appointed his chief rival, Henry Clay, Secretary of State with the presidential succession in view. The same notion has lingered to our own day and caused the Secretary of State to be termed the «Premier» of an administration; in itself an absurd and meaningless term, but with color given to it by the preference for this post among some of the ablest party leaders ambitious of the Presidency. The next officer added was the Secretary of the Navy, whose office was created in 1798. In 1829 the Postmaster-General was raised to the Cabinet, though the office had existed 35 years; in 1849 the Secretaryship of the Interior was created and made of Cabinet rank; in 1889 was added the Secretary of Agriculture, in 1903 the Secretary of Commerce and Labor. The last-named office was divided in 1913 into the Department of Commerce and the Department of Labor, and the executive heads of each accorded Cabinet rank. In accordance with Congressional action in 1886 the Cabinet officers rank in order of succession to the Presidency as follows: Secretary of State, Secretary of War, Secretary of the Treasury, Attorney-General, Postmaster-General, Secretary of the Navy, Secretary of the Interior, Secretary of Agriculture, Secretary of Commerce and Secretary of Labor. It will be noted that after the original four the others are named in the order of the creation of their departments, not of their elevation to Cabinet rank.

The President's Cabinet cannot, properly speaking, be called a cabinet, in the sense of a unified body, and only once has it been recognized by statute — in the General Appropriation Act of 26 Feb. 1907, where it is called by name in the clause fixing the salaries of its members. It does not act as a unit and has no responsibility as a unit. The word is merely a popular name for the group of officers in charge of the great branches of administration, whom the President consults individually or collectively at will or not at all. A more appropriate term for the President and his advisers would be «administration,» since this of itself indicates that the group is restricted to the field of law *operating* and not concerned with law *making*, thus distinguishing the group from the British Cabinet which combines both functions and thus may properly be called the «government.» The President is the head and centre of the administration, possessing all power of direction, short of suspending the laws, and usually co-operates with the department heads to enforce the principles of the party in power. There are no gradations of authority, the departments being equal in their subordination, and no means of inter-connection, save as they grow out of the Cabinet council. The department heads have nothing to do with legislation, and by law are prohibited from being members of the legislative body (Art. I, Sec. VI, ¶ 2 of the Constitution). Hence the privilege of debate and even of personal communication with Congress as a body has been withheld from department heads.

The Cabinet members are responsible only to the President in the sense that they are called to office by him and are subject to his dismissal at any time, whereas the President is responsible to the country by popular election. The President very seldom endeavors to direct ordinary department operations, but practical necessity has clothed the secretaries with a measure of authority and discretion. Hence, as department heads, the Cabinet officers are morally responsible to Congress and indirectly to the country for the conduct of the affairs of their separate departments. They are liable to censure and impeachment, and conviction on impeachment means removal from office, which also results actually though not technically from a vote of censure. Appointments of Cabinet officers are subject to the approval of the Senate, which is rarely withheld, and the only limitation on the power of removal is consideration of party welfare; the Tenure-of-Office Act of 1867 (q.v.) was an exception but this act was repealed. In forming his Cabinet, the President usually endeavors to strengthen his administration politically by observing a code of geographical and other rules, distributing his appointments to cultivate doubtful sections or to reward party strongholds. In early times the Cabinet changed with the party, but with the development of the powers of appointment and removal the Cabinet comes into office with the President and retires with him. While in foreign countries ability to debate, personal prestige and political sagacity are usually essential to cabinet appointments, the reverse is true of the President's Cabinet. The President may fill the various portfolios with totally unknown men, in reliance on their unproved abilities, without serious risk, and some of these appointments have been eminently successful. The Secretary of State is usually selected with the greatest care, since he is regarded as the head of the Cabinet in influence and follows the Vice-President in the presidential succession, but he has neither the powers nor the influence of the European Premier, these residing in the President and the Speaker of the House of Representatives.

Cabinet meetings are frequent, occurring twice a week (Tuesday and Friday) when the President is at the seat of government. The procedure resembles a conference of a board of directors, the nature of the discussions depending upon the President. Sometimes they degenerate into mere discussions of routine affairs connected with the various departments. There is no question as to what officers shall sit in the Cabinet nor can outsiders mix in its councils; at times, however, outside persons with information to impart have met with it, but this is regarded more as a special consultation than as a Cabinet meeting. The President's position as head of his party necessitates advisers outside his official household; and oftentimes he has certain intimates not connected with the government on whom he depends for impartial and unbiased opinions on matters of special importance to the country. Since Jackson's time these advisers have not attained such influence as to receive the title «Kitchen Cabinet.» Cabinet opinions carry weight according to the personality of the President and secretaries and surrounding conditions. As previously stated the President is not obliged to consult the Cabinet but is expected to do so. As a rule, however, he consults it regarding matters of grave public importance and very seldom takes action regarding departmental affairs without first consulting the several department heads.

The term cabinet is sometimes applied in the United States to the heads of State departments advisory to the governor, but this is even less justifiable than its application to the President's advisers, since the State officers are elected by the people on the same ticket with the governor and the latter has no power of appointment or dismissal. Its use in connection with the municipal officers accessory to a mayor has some justification, as many of these officers are appointed by him.

The history of the national executive departments and of the President's Cabinet will be found under the title United States — Beginning of Executive Departments of the and The Cabinet of the; also the departments by name. In this connection see also Congress; Congressional Government; Executive and Congress; The United States — The President's Office; The Vice-Presidency, and The Speaker of the House of Representatives.

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CABINETMAKING, the industry of making artistic furniture, fine inlaid woodwork, such as cabinets, sideboards, picture and photographic frames, tables, ornamented bedsteads and other articles for household and interior building decoration, cabinet organs, cabinet pianofortes, cabinet of arms, books, etc. A cabinet, specifically, is a piece of furniture with shelves or drawers, or both, or simply cup-boards enclosed within doors; and these usually range from those of plain and chaste style to those of a highly ornamented character, decorated with carving, inlaying, marquetry, lacquer, painting, porcelain insets and medallions, enamel or metal *appliqués*. Cabinetmaking also comprises fine and ornamental joinery, interior wood finish, paneling and lattice work, etc., with their adjuncts of varnishing and polishing. The art of cabinetmaking is said to have originated in the 15th and 16th centuries in Italy and soon spread to France, Germany, the Netherlands and Spain, the craftsmen of these nationalities in the 16th and 17th centuries, and English cabinetmakers in the 18th century, rivaling each other in the design and production of sumptuous, monumental and costly articles of furniture. Antwerp notably from the 16th century became famous for its output. Historic names among cabinetmakers are those of Boulle, Pierre and André Charles, and Jean Mace, Frenchmen, and Chippendale, English. See BUHLWORK; JOINERY; WOOD-CARVING.

CABIRI. See CABEIRI.

CABLE, George Washington, American novelist and miscellaneous writer: b. New Orleans, La., 12 Oct. 1844. His father died when he was 14 years of age, and he had to leave school and seek employment as a clerk in order to assist in the support of his mother and sisters. In 1863 he joined the Confederate army as soldier in a cavalry regiment, and served till the conclusion of the Civil War, when he returned to New Orleans and again took to commercial life. But in 1879, being by this time a practised writer, and having had considerable success with his literary ventures, he decided to devote himself entirely to authorship. In 1884 he took up his residence in Massachusetts, where he has originated a system of "home culture clubs," since developed into the People's Institute. Mr. Cable is a member of the National Institute of Arts and Letters and the American Academy of Arts and Sciences. His first important book, 'Old Creole Days' (1879), appeared originally in *Scribner's Magazine;* and since its publication he has written 'The Grandissimes' (1880); 'Madame Delphine' (1881); 'The Creoles of Louisiana' (1884), a history; 'Dr. Sevier' (1884); 'The Silent South' (1885), a plea for the negro; 'Bonaventure' (1888); 'The Negro Question' (1888); 'Strange True Stories of Louisiana' (1889); 'John March' (1894); 'Strong Hearts'; 'The Cavalier' (1901); 'Bylow Hill' (1902); 'Kincaid's Battery' (1908); 'Posson Jone' and Père Raphael' (1909); 'Gideon's Band' (1914); 'The Amateur Garden' (1914). The chief interest of Mr. Cable's novels lies in their excellent descriptions of Creole life, a subject which he may be said to have introduced into literature. His pictures of negro life are equally effective, and he handles dialect in a masterly manner. See GRANDISSIMES, THE; OLD CREOLE DAYS.

CABLE, a large, strong rope or iron chain used as a mooring tie. The term is most frequently used in its nautical sense to designate the means by which a ship is connected with her anchor. The large ropes used for towing, or for making a vessel fast to a buoy or pier, are commonly known as hawsers. In more recent times the term cable has been expanded to include also the large suspensory ropes (usually of twisted or parallel wires) from which suspension bridges are hung; the endless ropes used to operate the kind of street cars commonly called cable cars or grip cars; the suspended wire ropes known as cableways, for the transport of goods, building materials, etc.; the groups of telephone wires placed in underground conduits or strung overhead in leaden casings; the wires for high voltage electric transmission; the undersea telegraph conductors, and, in fact, any very strong flexible tension connection. Rope cables are made of hemp, manila or other fibre, or of wire, twisted into a line of great compactness and strength. The circumference of hemp rope varies from 3 to 26 inches. A certain number of yarns are laid up left-handed to form a strand; three strands laid up right-handed make a hawser; and three hawsers laid up left-handed make a cable. The strength of a hemp cable of 18 inches circumference is about 60 tons, and for other dimensions the strength is taken to vary according to the cube of the diameter. Wire rope has within recent years largely taken the place of hemp for towlines and hawsers on board ship. These usually consist of six strands, laid or spun around a hempen core, each strand consisting of six wires laid the contrary way around a smaller hempen core. The wires are galvanized or coated with a preservative composition. Wire ropes are usually housed on board ship by winding them round a special reel or drum. Hemp cables, moreover, have for long been almost wholly superseded by chain cables; the introduction of steam on board ship having brought in its train the powerful steam windlass wherewith to manipulate the heaviest chains and anchors required.

Chain cables are made in links, the length of each being generally about six diameters of the iron of which it is made, and the breadth about three and one-half diameters. They are generally of eight lengths of 15 fathoms each connected by swivels to prevent twisting. There are two distinct kinds of chain cables — the stud-like chain, which has a tie or stud welded from side to side of the long link, and the short-link or unstudded chain. The cables for use in the mercantile service are made in 15-fathom lengths, but in government contracts chain cables are required to be made in 12½-fathom lengths, with one swivel in the middle of every alternate length, and one joining-shackle in each length. Besides the ordinary links and joining-shackles, there are end-links, splicing-tails, mooring-swivels and bending-swivels. The sizes of chain cables are denoted by the thickness of rod iron employed in forging the links. The following table gives certain ascertained data concerning the cables in ordinary use:

Diameter of iron	Weight of stay-pin	Weight per fathom	Breaking strain
½ in.	½ oz.	13½ lbs.	6 tons
1 "	3½ "	54 "	24 "
1½ "	12 "	121 "	60 "
2 "	28 "	215 "	99 "
2¼ "	40 "	272 "	126 "

Compared with the strength of hempen cable, a chain cable of one inch diameter of rod is equivalent to a hemp cable 10½ inches in circumference; 1¼ inches, to 13½ inches; 1½ inches, to 16 inches; 1¾ inches, to 18 inches; and 2 inches, to 24 inches. In navigation a cable's length is a nautical measure of distance equaling 120 fathoms, or 720 feet, by which the distances of ships in a fleet are frequently estimated. This term is often misunderstood. In all marine charts a cable is deemed 607.56 feet, or one-tenth of a sea mile. In rope-making the cable varies from 101 to 115 fathoms; cablet, 120 fathoms; hawser-laid, 130 fathoms, as determined by the British Admiralty. According to Ure a cable's length is 100 to 140 fathoms in the merchant service. The wire rope used for submarine telegraphy is also called a cable. See CABLES, SUBMARINE.

CABLE, Submarine specially constructed ropes of wire, hemp and gutta-percha, or other waterproofing and protecting materials, laid on ocean or river beds for the purpose of providing means of electrical communication across large bodies of water.

Until the discovery of gutta-percha such communication was impossible, as water is so good a conductor of electricity that the submersion of current-carrying wires was dependent upon complete insulation. In this gum, however, such a perfect insulator was found that submarine communication all over the world became merely a question of time, experience and necessity. In 1843 Prof. S. F. B. Morse suggested electrical communication between the United States and Great Britain, but it was not until more than 20 years had passed that practical telegraphy across the Atlantic Ocean was established.

Early Cables.— The first under-water cables were short ones laid across rivers; later the English Channel was electrically «bridged» in this manner. In 1852 Dover and Ostend were connected by a cable 75 miles long and containing six wires. In 1854 Sweden and Denmark, Italy and Corsica, and Corsica and Sardinia were linked. In the same year the New York, Newfoundland & London Telegraph Company was incorporated, mainly through the efforts of Cyrus W. Field and Peter Cooper, of New York, for the purpose of laying a cable between Newfoundland and Ireland, a distance of about 2,000 miles. It received a charter from the Newfoundland legislature, with an exclusive right for 50 years to establish a telegraph between the American continent and Europe via Newfoundland. In 1856 Cape Ray and Cape Breton were united, as well as Prince Edward's Island and New Brunswick. The same year Mr. Field organized the Atlantic Telegraph Company. It was supported by both the United States and British governments, but the results of its efforts were discouraging for several years. In August 1857 an attempt was made to lay a cable by the American frigate *Niagara* and the British ship-of-war *Agamemnon,* but about 300 miles from the Irish coast the cable parted, owing to a strain caused by a sudden dip of the sea-bottom. In 1858 the same two ships, each with half the cable on board, steamed to a point in the Atlantic midway between Valentia, Ireland, and Heart's Content, Trinity Bay, Newfoundland, spliced the cable, and, steering in opposite directions, safely landed the ends at their destinations on 5 August. The cable was 2,500 miles in length, weighed about one ton per mile and cost $1,256,250. It was composed of seven copper wires encased in gutta-percha, which in turn was surrounded by a covering of hemp saturated with oil, pitch and beeswax; the whole being protected by an outer sheath composed of 18 strands of seven iron wires each. Despite the success in laying, however, the cable was practically useless. The current was so weak that a message of 90 words from Queen Victoria to President Buchanan took 67 minutes to transmit, and after a few more messages the cable ceased to transmit signals. Two more cables were laid in this year to connect Great Britain with the Continent,— one to Holland and the other to Hanover; and 1859 saw, among other cable connections, the joining of England with Denmark and France, and of Malta with Sicily. In 1860 a cable was laid between France and Algiers, and in 1861 Malta was connected with Alexandria and Batavia with Singapore. Failures were met with in attempts to lay cables through the Red Sea and from Falmouth to Gibraltar, and these, with the ill-success of the Atlantic cable, caused great disappointment to the promoters of the latter enterprise. Capital seemed to have made up its mind that a successful cable across the Atlantic was impossible. In 1865, however, another cable of 2,300 miles and weighing 4,000 tons, was shipped on the *Great Eastern,* and was successfully paid out for 1,065 miles from Valentia, when it broke, and was abandoned after vain attempts to grapple the lost end. The following year the *Great Eastern* sailed with a lighter but stronger cable of 2,370 miles and laid it successfully. She then grappled the lost cable of the year before, recovering it from a depth of two miles, spliced it and completed the task by landing the end at Heart's Content.

Advance in Cable-Laying.— With two cables now linking America and Great Britain, confidence was restored, and the manufacture and successful laying of submarine cables went on at a rapid rate. In 1869 a line was laid from Brest, France, to Saint Pierre, Newfoundland (a distance of 3,100 miles), by a French company. In 1873 a cable joined the cities of Lisbon and Pernambuco, and in 1874 and 1875 two more cables were laid between Valentia and Heart's Content. The latter weighed less than 900 pounds per mile. Another line from Penzance, Cornwall, to Saint Pierre, 2,920 miles, was laid in 1879, and one from England to Panama in 1882.

Meanwhile an incident had occurred which greatly influenced the expansion of submarine cable systems. In 1870 the British government purchased the entire land telegraph system of the British Isles, and the capital thus liberated, about $50,000,000, was largely reinvested in submarine cable ventures. In 1872 a number of small competing companies with lines through the Mediterranean were consolidated into the Eastern Telegraph Company, and in the following year the Eastern Extension, Australasian & China Telegraph Company was formed by the amalgamation of companies owning cables farther east. Since then the Eastern, Eastern Extension and Associated Cable companies have become practically one immense organization.

In 1884 John W. Mackay and James Gordon Bennett organized a cable system across the Atlantic from Valentia to Torbay, N. S., in the interests of the Commercial Cable Company and the New York *Herald*. Consolidation of competing companies followed as a matter of course, and now there are practically, besides the French lines, but two competing cable companies in the north Atlantic field — the Anglo-American and the Commercial Cable companies. There are now 15 cables between North America and Europe, some of which run into New York harbor. The cables of 1858, 1865 and 1866 are "dead," and three others have but a brief tenure of life. Nine are "alive" and active.

About 1902 France undertook to lay cables to connect her colonies, and now has over 12,000 miles in operation. A little later the Commercial Cable Company laid its fourth line to connect New York and London, by way of Rockport, Mass., Canso, N. S., and Waterville, Iceland. The European War put a check on cable-laying for several years.

Pacific Cables.— In the Pacific Ocean the Commercial Company has constructed a cable 6,912 miles long and costing $12,000,000, laid from San Francisco, via Honolulu, the Midway Islands and Guam to Manila, in the Philippines, with an ultimate extension to Shanghai or Hongkong. The first section, from San Francisco to Honolulu, 2,413 miles, was opened 1 Jan. 1903. This section is the most hazardous on the route, depressions of 5,160 and 5,269 fathoms having been encountered, and the profile displaying mountains of immense elevation and valleys of corresponding depth. A level plain, with an average depth of 2,700 fathoms, extends throughout the second section, from Honolulu to the Midway Islands, the bottom being of soft mud and extremely favorable for cable-laying. Thence toward Guam an average of 3,200 fathoms is found, and favorable conditions are maintained throughout. The last section is similar in its profile to the first, though the depth averages less, being from 1,400 to 2,700 fathoms. The sea-bed is extremely irregular in outline, with many reefs and depressions.

The cable is built around a core formed of copper wire insulated by gutta-percha, around which layers of jute yarn are wound. This, in turn, is sheathed in small cables, each formed of several strands of steel wire. An outer covering of jute yarn, the whole saturated with a bituminous compound, binds together the conducting and protecting wires in one solid mass. The landing of the shore end of the cable at San Francisco was effected thus: A section of six and one-half miles was cut from the main cable on board the cable-steamer *Silvertown* and loaded on a tender, which steamed toward the shore. On approaching the line of breakers, which were heavy, the shore end was floated on balloon buoys placed every 10 fathoms, and a team of 12 horses dragged it ashore, where it was spliced to the permanent shore connection, and the tender returned to the *Silvertown*, on board which the shore section was respliced to the main cable. The cable-ship then started for Honolulu in the evening of 14 Dec. 1902.

The *Silvertown* was specially built for cable-laying purposes. On this trip she carried 2,413 nautical miles of cable, weighing 4,807 tons. She arrived off Honolulu on 25 December and landed the shore end by buoying the cable; but she employed no tender or horses. Two spider-sheaves were sent ashore and fixed by sand anchors about 60 yards apart. A hauling-line was paid out from the ship, reeved through the sheaves and brought on board again. One end of this line being attached to the cable and the other to the picking-up gear, the engines were started and the cable was dragged toward the shore.

Another Pacific cable has been constructed jointly by the governments of Great Britain, Canada and Australia across the Pacific from Vancouver to Fanning Island, Fiji Islands, Norfolk Island, and thence to New Zealand and Australia. It is practically 8,000 miles long, and the 3,600-mile stretch from Vancouver to Fanning Island makes the longest single section in the world. This cable brought the Australasian colonies 10,000 miles nearer to Canada than they were before, and there is now completed a British telegraph girdle of the world which touches foreign territory only at Madeira and Saint Vincent, in the Cape Verde Islands, both belonging to Britain's old ally, Portugal.

Mention has already been made of the consolidation of competing lines in the Mediterranean and the East into the Eastern Telegraph Company. To this huge organization belongs a marvelous network of submarine cables — practically all the cables from Land's End, in England, through the Mediterranean to Suez, on through the Red Sea to Aden, across the Indian Ocean to Bombay, thence linking into the system Madras, Singapore, Hongkong, Manila, Australia and New Zealand. In addition, practically all the cables which now surround Africa, and many of those which cross the ocean and follow the coast-line of South America, are in its control. To such an organization the laying of 15,000 miles of cable from England to Australia, via the Cape of Good Hope, at a cost of over $15,000,000, was comparatively easy. Yet this great line may be traced from Land's End in England to Adelaide in South Australia, a distance which a modern Atlantic liner would take six weeks to steam over. The length of cable is more than half way round the globe, and about eight times longer than the first Atlantic cable.

The life of a deep-sea cable, aside from injuries by ship's anchors, rocks, sharks, sawfish and swordfish, has been variously estimated at from 30 to 40 years. Sharks occasionally bite cables and leave some of their teeth embedded, and sawfish and swordfish attack them, especially in tropical waters, but on the level plains of ooze two miles or more below the surface cables seem to be almost imperishable. In shallow water they are most exposed to damage. Deep-sea cables generally weigh from one to one and a half tons per mile, but the portions lying in shallow water are so heavily armored as to weigh from 10 to 30 tons per mile. The breaking strain is about seven tons. Yet in one year the ocean cables of the Commercial Company were severed by ships' anchors five times. In the Firth of Forth in Scotland no less than 13 ship's anchors were once found entangled in a length of four miles of cable. The deep-sea cable costs about $400 per mile, is made in lengths of 15 to 25 miles and stored in coils in a cable-laying steamship. The cost of coast cables may run up to $5,000 a mile, as they have usually paper insulation, covered with a lead sheath, and heavily armed with wire. Coast cables are made in mile lengths and stored on large reels.

Cable Tariffs and Codes.— In the early days the Atlantic Telegraph Company started with a minimum tariff of $100 for 20 words, and $5 for each additional word. Later this was reduced to $25 for 10 words. It was not till 1872 that a rate of $1 a word was introduced. This word rate system proved so popular that it was soon adopted universally, and since 1888 the cable rate across the Atlantic has been down to 12½ cents a word. Rates now range from the 12½-cent tariff across the Atlantic to $1.33 per word from New York to Japan. The average for the whole world is roughly 50 cents a word. The cost of cabling, however, is greatly influenced by "coding," a system by which business men use secret words for commercial messages, and which has developed to an extraordinary degree of perfection. One code word will frequently stand for 10 or 15 words, and there are instances where one word has been used to represent over 100 words. Practically all commercial cablegrams are coded, and nearly all departments of commercial and industrial life nowadays have their special codes.

Speed of Transmission.— The cost of deep-sea cables makes it vitally important to get as much work out of them as possible. In the first place the transmission time of messages has been greatly reduced. Formerly from many parts of the world it took 5 or 10 hours to deliver a cablegram where it now takes from 30 to 60 minutes, and across the Atlantic the companies, for stock-exchange purposes at any rate, send a cablegram and get a reply in two or three minutes. In the second place, where traffic is heavy, speed of transmission of the signals has been greatly increased. Across the Atlantic and on three or four of the busy lines of the Eastern Company the art of cable telegraphy has been highly developed.

On the first Atlantic cables the speed was about seven words a minute in one direction only. The speed of recent Atlantic cables is as high as from 40 to 45 words a minute in both directions — that is, from 80 to 90 words a minute. Thus, compared with the early days, the speed and therefore the value of the best cables has been multiplied more than 10 times over by means of some of the most ingenious and delicate machinery in modern industry. On the first Atlantic cable it was found that, using land telegraph methods of signaling, the speed was only one or two words a minute. The first great forward step was to send exceedingly feeble currents and to use extremely sensitive receiving instruments. Lord Kelvin's mirror galvonometer supplied the instrument needed. By this means the speed of the early Atlantic cables was raised to seven or eight words a minute. Subsequently, when heavier cables were laid, the speed was increased to as much as 20 words a minute.

The Siphon Recorder.— In 1870 Lord Kelvin perfected his siphon recorder for working long cables, and it at once supplanted the mirror instrument, as it worked just as well with feeble currents, gave a written record of signals received and enabled one man to do the work of two. An exceedingly light coil of fine wire (in shape and size like the long, narrow O which would be obtained by winding several hundred turns of fine silk thread around the palm of the open hand) is delicately suspended between the two poles of a powerful magnet. As the electric signals from the cable flow through the coil of wire, it swings round under the influence of the magnet, back or forward according as the current is positive or negative. The motions of the coil are transmitted by silken fibres to a little glass siphon about as thick as a needle and three or four inches long, suspended so as to swing with perfect freedom. One end of the siphon dips into a pot of ink, and the other end hangs close above a moving strip of paper. The signals are so feeble that if the end of the glass siphon rested on the paper it would not move at all, but by causing the siphon to vibrate continuously against the paper the free motion of the siphon is not interfered with, and the ink is spluttered upon the paper so that the siphon traces a line of very fine dots and thus records the signals transmitted through the cable. This instrument, though crude at first, has gradually been perfected. It is now the most important part of modern cable apparatus.

The Duplex System.— The next improvement, undoubtedly the greatest ever made for increasing speed, was the invention of a successful system of "duplexing" cables by Dr. Alexander Muirhead and Herbert Taylor in 1875. This invention rendered it possible simultaneously to send messages both ways through a long ocean cable. In 1878 the Direct United States cable across the Atlantic was successfully duplexed, and a speed of 16 words a minute obtained each way at the same time. Duplexing cables has now become such a fine art, chiefly through the labors of Dr. Muirhead, that the capacity of cables, and therefore their commercial value, has been practically doubled. Since 1875 about 100,000 miles of ocean cables have been duplexed almost entirely on the Muirhead system.

The increasing traffic across the Atlantic and the pressure of competition led next to an increase in the size of the copper "core" which conducts the electric signals. The resistance of a wire delays the electric current and therefore the speed. By doubling the size of the copper core the resistance is halved and the speed greatly increased. The copper wires used for telegraphy on land weigh about 200 pounds per mile. In 1894 two cables were laid across the Atlantic, one for the Commercial Cable Company and the other for the Anglo-American Company. The copper core of the former weighed 500 pounds per mile, while the latter weighed no less than 650 pounds per mile, or as much as three ordinary land wires. The result was that the speed obtained with these two cables was as high as 40 to 50 words a minute, or, working duplex, from 80 to 90 words a minute. On previous Atlantic cables 25 to 28 words a minute was the maximum each way. Owing to the reduction of rates the benefit of this tenfold increase of speed since the early days has gone almost entirely to the general public.

Automatic Transmission.— The increase in speed brought up another difficulty. No human operator can send so fast. The key used for signaling through the cables by hand is practically the same as the ordinary Morse key used for land telegraphy, except that two keys are used side by side, one to send positive signals and the other negative signals, the letters of the alphabet being indicated by various arrangements of the two kinds of signals. First-class cable operators can send as many as 30 words a minute for a few minutes, but a sustained speed of 20 words a minute, when working by the hour, is regarded as very good. To take full advantage of the speed of a modern Atlantic cable, therefore, it is necessary to have some automatic method of transmitting. The advantages of automatic transmission are higher speed, greater uniformity of signals, more legibility and fewer mistakes.

The method adopted is simple and beautiful, — a modification of the Wheatstone system. The message is first punched as a series of holes in a paper tape. This perforated tape is then run through an automatic transmitter, and by means of a system of small levers the required signals are transmitted at any desired speed. The operator has a wooden stick in each hand with which he strikes one or other of the three keys of the small perforator directly in front of him. One key punches a right-hand hole, another key a left-hand hole and the middle key makes a space. In this way the cablegram before him is transmitted at the rate of about 20 words a minute into a perforated tape. From the perforator the tape runs into an automatic transmitter, or "auto." There is a row of small central holes in the tape, and on each side is a row of larger holes. The latter represent the message. A small star wheel in the "auto" engages with the central line of holes and feeds the tape along at a uniform rate. A couple of small steel rods about the size of a knitting-needle, one for each of the two rows of message holes, continually vibrate against the paper. When either of them enters a perforation in the paper, a lever connected with it moves and makes an electric contact, sending a short, sharp signal into the cable.

Cable Relays.— Recently several still more wonderful inventions have been perfected. On land relays are used. For instance, messages from New York to Chicago are automatically repeated at Buffalo or Meadville and by automatic repeating every 600 or 800 miles it is an every-day occurrence to telegraph direct between New York and San Francisco. A relay capable of performing similar work for cables has been a dream of cable engineers and inventors for years, and in default of such an instrument "human relays" have been employed; that is, at the end of one section of a cable an operator takes the paper record of a cablegram as it comes from the siphon recorder and retransmits it.

But the cable relay is now an accomplished fact. The only hope of constructing such an instrument was to utilize the siphon recorder. One difficulty has been that the movements of the siphon, as shown by the paper records, have till recently been most irregular. There has been what photographers would describe as "lack of definition" about the signals, rendering it hopeless to attempt to relay them automatically by machinery. The first thing to do was, therefore, to straighten and sharpen up the signals a bit, and a very able group of cable engineers, including H. A. C. Saunders, electrician-in-chief of the Eastern and associate cable companies, his assistant, Walter Judd, with Dr. Muirhead, inventor of the cable duplex, and Messrs. Brown and Dearlove, succeeded in sharpening them. They secured very regular signals, usually described as "square signals." This result was obtained by means too technical to be described here, but the chief device used is known as an "inductive shunt." Having squared the signals, it was now possible, though by no means easy, to construct a cable relay. Two have been perfected. One is known as the Brown & Dearlove relay, the principal inventor of it being S. G. Brown. The other has been invented by Dr. Muirhead. In both a fine wire terminating in a platinum contact-point takes the place of the ink in the siphon of a recorder. The contact-point instead of resting on the paper tape rests on a rapidly moving metallic surface divided into two parts. In the Brown & Dearlove relay this contact-surface consists of a constantly revolving metallic drum or wheel. The siphon, with its wire and contact-point, "skates," as the inventor describes it, with the utmost freedom on the periphery of this wheel. The drum looks like a phonograph cylinder. As the siphon skates upon the right or left half of this drum it makes a positive or a negative electric contact and automatically transmits a corresponding signal with renewed energy into the next section of cable. In the Muirhead relay the moving metallic surface consists of a small plate vibrating rapidly. The result is the same. Able in this way to make definite electrical contacts through a long ocean cable, an operator can easily work, by means of these contacts, local apparatus moved by more powerful currents. In this way both Mr. Brown and Dr. Muirhead have devised perforators which reproduce at the receiving station perforated tape identical with that used for transmitting the message at the sending station. This tape is available for transmission through an "auto," this plan having the advantage that the signals are retransmitted in as perfect form as the original signals; and, theoretically at any rate, the process may be repeated indefinitely, so that it would be possible to send a cable message automatically through a dozen stations from England to Australia. This will no doubt be done in time, but it is a very slow process getting such complicated and delicate inventions into commercial use. It is a question of time and growth. The Brown & Dearlove relay has been adopted by the Eastern Company, and has been in commercial use. Dr. Muirhead's relay has also proved very successful in several long-distance tests.

Cable Statistics.— In all there are now about 291,000 nautical miles of submarine cables, enough to go about 13 times around the globe. They have cost about $250,000,000, but their market value is considerably higher, as deep-sea cables are solid and profitable investments. All told there are about 50 cable steamers in the world, including those owned by the cable-construction companies and governments, with gross tonnage of perhaps 85,000 tons.

The Eastern Telegraph Company owns 107 ocean cables of a total length of 46,790 nautical miles. Its cables extend from England to Spain, all through the Mediterranean and Black seas, to most important points in Africa and on to Australia. The Eastern Extension, Australian & China Telegraph Company owns 37 cables of 26,421 miles. The next largest is the Western Telegraph Company, with 30 cables of a total length of 23,836 miles, extending from Portugal across the Atlantic to the principal ports on the east coast of South America. The Western Union Telegraph Company's system is almost as extensive, comprising 27 cables of 23,508 miles. It controls three transatlantic cables and the Gulf of Mexico system. The Commercial Cable Company's system from Ireland via Nova Scotia to New York employs 15 ocean cables with a mileage of 16,595. The Central & South African Telegraph Company has 25 cables of 11,896 miles. La Compagnie Française des Cables Telegraphiques has 24 cables of 11,657 miles, connecting Brest, France, with Cape Cod, Mass., and also Saint Pierre and San Domingo. The Eastern & South African Telegraph Company has 17 cables of 10,490 miles. The Commercial Pacific Cable Company has 8 cables of 10,010 miles, connecting San Francisco with Guam, Manila and Shanghai. La Compagnie Allemande des Cables Transatlantiques has 5 cables of 9,556 miles, connecting Coney Island, N. Y., with Borkum Island, the Azores and Spain. La Grande Compagnie des Telegraphes du Nord has 29 cables of 9,331 miles, connecting northern Europe and Asiatic ports. Die Deutsch-Sudamerikanische Telegraphen-Gesellschaft has 5 cables of 7,354 miles. The West Indian & Panama Telegraph Company has 22 lines of 4,355 miles. Die Deutsch-Niederlandische Telegraphen-Gesellschaft has 3 cables of 3,415 miles. There are 17 other private companies operating 66 submarine cables of a total length of a little over 20,000 miles; the total of privately-owned lines being 418, of 235,680 nautical miles.

The nations of the world own and operate over 2,000 short submarine cable lines, of a total nautical mileage of 55,207 miles. The longest of these is the line from British America through the Pacific to Australia. The greatest number is in Norway, 770, but they average less than two miles in length. The United States owns 15 to and about Alaska, and 26 in the Philippines. Japan has 181, of 5,000 miles; Spain has 25, of 3,158 miles; France 79, of 12,348 miles; there are 224, of 2,909 miles, in the British Isles; Germany controls 98, of 2,956 miles, and the Netherlands 27, of 5,130 miles. Many of the terminals in the countries engaged in the European War have been cut and are out of service until peace is restored and they can be patched up.

CHARLES H. COCHRANE,
Author of ‹Modern Industrial Progress.›

CABOOL. See KABUL.

CABOOSE, că-boos', the cook-room or kitchen of a ship. In smaller vessels, the name is given not to a room but to an enclosed fire-place, hearth or stove, for cooking on the main deck. The cook-room is also known as the «galley.» The name caboose is also given to a railroad car on freight or construction trains used for carrying brakemen or workmen, tools, etc.

CABOT, George, American statesman: b. Salem, Mass., 3 Dec. 1751; d. Boston, 18 April 1823. He was educated at Harvard College, spending two years there, and afterward going to sea. He reached the rank of captain while still under 21 years of age. In 1776 he was elected member of the provincial congress of Massachusetts and also of the State Constitutional Convention, and in 1791 he became United States senator for Massachusetts, and proved a steadfast friend of the Washington administration. He yielded essential aid to Hamilton in perfecting his financial system. President Adams appointed him first Secretary of the Navy, after the creation of that office in 1798, but Cabot served only one month. In 1814 he was chosen a delegate to the memorable Hartford Convention, and was elected president of that assembly. In 1793 he introduced the Fugitive Slave Act in the Senate. Consult Lodge, H. C., ‹Life and Letters of George Cabot› (Boston 1877).

CABOT, James Elliott, American biographer: b. Boston, Mass., 18 June 1821; d. 16 Jan. 1903. He was the friend and literary executor of Emerson and in 1887 published ‹A Memoir of Ralph Waldo Emerson,› a work undertaken at the request of the Emerson family.

CABOT, John, or GIOVANNI CABOTO (in the Venetian dialect, ZUAN CABOTO), an Italian navigator in English employ; the discoverer of the continent of North America. On 5 March 1496 he was given by Henry VII of England letters patent authorizing him to take possession of any countries he might discover. Under this charter, in May 1497, he embarked in a single vessel, the *Matthew* of Bristol, accompanied by his son Sebastian, and sailed west, as he said, 700 leagues, when, on 24 June 1497, he came upon land which he reported to have been a part of a continent, and which he assumed to be in the dominions of the Grand Cham. A letter of that year represents him as having sailed along the coast for 300 leagues; he landed, but saw no person, though he believed the country was not uninhabited. He planted on the soil the banners of England and of Venice. The exact spot of his landing is not known, but from the La Cosa map and the map of Sebastian Cabot it appears to have been a point on the coast of Cape Breton, more than a year after Columbus discovered the main land of the continent at Venezuela. On his return voyage he discerned two islands to the starboard, but for want of provisions did not stop to examine them. He reached Bristol in August. His discovery attracted the favor of the English King, who on 3 Feb. 1498 granted him letters patent to impress six English ships at no higher charges than were paid for ships taken for the King's service, to enlist companies of volunteers, «and theym convey and lede to the londe and iles of late founde by the seid John.» He sailed early in May with two ships, and after a stormy voyage sighted early in June the east coast of Greenland, which he named «Labrador's Land.» He then turned south, skirting the coasts of Nova Scotia and New England, and is believed to have reached the parallel of 38° near Chesapeake Bay, after which the return voyage was made. He then passes out of history. Neither the time nor the place of his death, nor his age, is known. Neither is it known what country gave him birth. He was a Venetian only by denization. Consult Beazley, ‘John and Sebastian Cabot’ (New York 1898); Biggar, H. P., ‘The Precursors of Jacques Cartier’ (Ottawa 1911); Harrisse, H., ‘John Cabot, The Discoverer of North America, and Sebastian, His Son: a Chapter of the Maritime History of England under the Tudors (1496-1557)’ (London 1895).

CABOT, Sebastian, English navigator: b. Bristol, about 1474; other authorities say 1477; d. London 1557. He was the son of John Cabot (q.v.). Sebastian was early instructed in the mathematical knowledge required by a seaman, and at the age of 17 had made several voyages. In 1496 John Cabot obtained from Henry VII letters patent empowering him and his three sons, Lewis, Sebastian and Sanctius, to discover unknown lands, and conquer and settle them. In consequence of this permission John and Sebastian sailed to the northwest on 2 May with the *Matthew* of Bristol, manned by a crew of 18 men. In June 1497 the coast of Cape Breton, or, as some think, of Labrador, was reached. The accounts of this voyage are attended with much obscurity; but a second patent was granted to John Cabot in 1498, and it seems that in a subsequent voyage, the father and son sailed as far south as Chesapeake Bay and were actually the first who saw the mainland of America. Little, however, is known of the proceedings of Sebastian Cabot for the ensuing 20 years; but it seems that, in the reign of Henry VIII, by the patronage of Sir Thomas Peart, vice-admiral of England, he procured another ship to make discoveries, and attempted a southern passage to the East Indies, in which he failed. This disappointment is supposed to have induced him to quit England in 1513 and visit Spain, on the invitation of Ferdinand. The death of the King lost him his patron, and in a few years he returned to England and was employed by Henry VIII to find out the northwest passage. After this expedition he again entered the Spanish service, and in 1526 began a voyage which resulted in his reaching the river La Plata, where he discovered San Salvador, and erected a fort there. He returned to England after the death of Henry VIII and settled in Bristol. He was introduced by the protector Somerset to Edward VI, who settled a pension on him. From this time he was consulted on all questions relating to trade and navigation; and in 1552, being governor of the company of merchant adventurers, he drew up instructions and procured a license for an expedition to discover a passage to the East Indies by the north. He was also governor of the Russian Company, and was very active in its affairs. He was the first who noticed the variations of the compass; and he published a large map of the world, as also a work under the title of ‘Navigazione nelle parti Septentrionali, per Sebastiano Cabota’ (1583). See Nicholls, ‘Remarkable Life of Sebastian Cabot’ (London 1869); Winship, ‘Cabot Bibliography’ (1900), and Henry Harrisse's unflattering portrayal in ‘John Cabot and His Son Sebastian’ (London 1895).

CABRA, kä'brą, Spain, town in the province and 29 miles south-southeast of Cordova, in a valley almost environed by mountains. It has wide streets; a large, irregular, but imposing looking square; two large and handsome parish churches; a richly endowed college, etc. Captured from the Moors by Ferdinand II in 1240, and recaptured in 1331, in the succeeding century it passed finally into the possession of Spain. It has manufactures of coarse cloth and bricks. Pop. 12,181.

CABRAL, or CABRERA, Pedro Alvarez, pā'drō äl'vą-rěth ką-bräl', Portuguese navigator: b. about 1460; d. about 1526. In 1500 he received command of a fleet bound for the East Indies, and sailed from Lisbon, but having taken a course too far to the west he was carried by the South American current to the coast of Brazil, of which he took possession about 24 April 1500, in the name of Portugal. Continuing his voyage he lost several ships and men in a storm, but with the remainder he visited Mozambique, and at last reached India, where he made important commercial treaties with native princes, founded a trading-post at Calicut and then returned to Europe. Despite his discoveries he was for some reason not retained in the service and sank into obscurity. Consult Fiske, ‘Discovery of America,’ Vol. II (Boston 1892); Capistrano de Abreu, ‘Descobrimento do Brasil’ (Rio de Janiero (1883); Varnhagen, ‘Historia general do Brazil’ (2d ed., 2 vols.).

CABRERA, Ramon, Carlist general: b. Tortosa, Catalonia, 31 Aug. 1806; d. Wentworth, England, 24 May 1877. He was brought up for the clerical profession, for which, however, he was unfitted by his love of pleasure and dissipation. When civil war broke out between the partisans of Don Carlos and those of the Queen Isabel II, the priests became the most zealous champions of Don Carlos, and their enthusiasm acted so powerfully upon the impetuous spirit of young Cabrera, that he joined in 1833 a small band of guerrillas. He fought with singular ferocity, which rose to fury, when, 16 Feb. 1836, upon the order of the Queen and of Mina, General Nogueras put to death Cabrera's aged mother and his three helpless sisters. Cabrera took vengeance upon all the Christinists who fell into his hands. His enemies treated him like a wild animal, and hunted him, after he had laid waste Aragon, Valencia and Andalusia, from one place to another. After a temporary defeat at Torre Blanca he eventually took Morella. Hence in 1838 Don Carlos created him Count de Morella, and at the same time lieutenant-general, and in this capacity Cabrera continued to fight for the cause of the Pretender, and for what he considered the cause of the priesthood and the Church, until 1840, when he was compelled to flee to Paris. By order of Louis Philippe he was arrested and consigned to the fortress of Ham, but was soon set free. In 1848 the French revolution filled Cabrera with the most sanguine expectations; which, however, were doomed to disappointment, as on his arrival in Catalonia he was but indifferently received, and on 27 Jan. 1849, he was severely wounded at Pasteral, although he succeeded in making good his escape to France. In August of the same year he took up his abode in London, where he married a rich English woman. When Alphonso XII was proclaimed King of Spain in 1875 Cabrera advised the Carlists to submit to him. Consult Valras, ‘Don Carlos VII et

Ramon Cabrera,' translated from the Spanish (Paris 1875); Dias and Cardenas, 'Galería de Españoles célebres contemporáneos,' Vol. I (Madrid 1841); Valle Inclán, 'La guerra carlista' (Madrid 1908).

CABRERA, a small Spanish island, one of the Balearic Isles, about 10 miles from Majorca. It is about three miles in length and breadth and the coast is irregular. The chief industry of the island is fishing and the permanent population is very small. During the war in the Peninsula Spain used it as a place for receiving convicts.

CABRERA BOBADILLA CERDA Y MENDOZA, kạ-brā'rạ bō-bạ-dēl'yạ thăr'dạ ē mĕn-dō'thạ, **Luis Gerónymo Fernandez de,** Spanish colonial governor: b. Madrid, about 1590; d. near there 1647. He was viceroy of Peru 1629–39, during which period the useful properties of cinchona bark were discovered and the third ascent of the Amazon made. The cruelty of the Spaniards caused a revolt among the Urn Indians near Lake Titicaca, which Cabrera had great difficulty in suppressing.

CABRILLA, or **HIND,** one of the sea-basses (*Epinephelus maculosus*) found in the Atlantic from Charleston to Brazil. It attains a length of 18 inches and is highly esteemed as food. Another sea-bass (*Paralabrax maculatofasciatus*) living along the coast of lower California and highly regarded as a food-fish; is called the spotted cabrilla. See Sea-bass.

CABRILLO NATIONAL MOVEMENT, created 14 Oct. 1913, at Point Loma, Cal., of a small tract of land containing 21,910 square feet which lies within the military reservation at Fort Rosecrans. It is of historic interest because of the discovery of the territory now partly embraced in the State of California, by Juan Rodriguez Cabrillo, who at this point first sighted land on 28 Sept. 1542.

CABUL, CABOOL or **KABUL.** See Kabul.

CACAHUATE, CACAHUETE, **kă-kă-wă'tā** (nahuatl, "*Cacahual*"), the indigenous peanut of Mexico and Central America. It is practically the same as the *maní* (q.v.) of Cuba and parts of South America, and it is very much like the same member of the family grown in the United States. The cacahuate has been a common food of the indigenous races of the torrid zone of America since prehistoric days. At the time of the conquest of Mexico (1521) the Spaniards found it among the many kinds of fruit and vegetables displayed on the great market of Tenochtitlán (Mexico City). The cacahuate was one of the offerings made to the goddess of growth, fertility and birth, and on certain festive occasions it was the only offering made. A distant echo of this very ancient religious custom is still heard in Mexico during the *novenas* or nine days of semi-religious celebration which precede Christmas day, when it is used to stuff earthen jars which are placed on the inside of cardboard, paper or tissue-paper figures or decorations. These latter are suspended from the ceiling of the house or in a yard to be knocked down by blind-folded children or young people in a game very much like blindman's buff. For hundreds of years the Mexicans have extracted from the cacahuate a light oil which, when burnt, gives a beautiful, strong, white light. Cacahuate nuts are sold everywhere in Mexico and Central America, in little stores, on the markets and on the street corners of the towns and villages, and every one buys them as candies are bought in other countries.

CACAO. See Cocoa.

CACCIANIGA, kăt-chă-nĕ'ga, **Antonio,** Italian writer: b. Treviso 1823; d. 1903. He founded a satirical magazine called *Lo Spirito Folletto* at Milan in 1848; being exiled after the revolution of 1848 was for six years a journalist in Paris. He was subsequently mayor of his native town and a parliamentary deputy. He is the author of some notable works of fiction, including 'Il proscritta' (1853); 'Bozzetti morali ed economici' (1869); 'La Vita Campestre'; 'Villa Ortensia' (1876).

CACCINI, kă-chē'nē, **Giulio,** Italian composer: b. Rome about 1546; d. Florence 1618. He was styled the father of a new music, having been the first to write an opera for performance in a public theatre. His works include 'Daphne,' and 'Apollo's Battle with the Serpent.'

CÁCERES, kă-thă'rās, **Andrés Avelino,** Peruvian military officer and statesman: b. Ayacucho, in southern Peru, 10 Nov. 1836; d. 20 Nov. 1911. While still young he was actively engaged in political strife, serving as an officer under Castilla and Prado, and when the latter was overthrown was imprisoned for a year. He distinguished himself at the taking of Arequipa. In 1857 he became military attaché to the legation of the Peruvian government at Paris, and was stationed at that post until 1860. In the Chilean War (1879–83) he served in nearly all of the battles, being rapidly promoted from colonel to the rank of general, and, after the taking of Lima, was made 2d Vice-President in the provisional government of Calderon (June 1883). The imprisonment of Calderon the President, and the absence of the 1st Vice-President made him acting President of Peru. In his refusal to acknowledge Iglesias, whom the Chileans had placed at the head of the government at Lima, as President, Cáceres was supported by the interior provinces, and he at once planned to depose him. In his first attempt to take Lima, in August 1884, he was repulsed in a bloody street fight, but after raising a larger force he appeared before the city, 1 Dec. 1885, and peaceably persuaded Iglesias to submit the office of President to a general election. This resulted in the election of Cáceres, and on 3 June 1886 he was inaugurated President of Peru. The country prospered greatly under his administration, gradually recovering from the ill effects of the war; a private company absorbed the state railroads and guano beds and took over a portion of the national debt. In 1890 he was defeated for the Presidency by Bermudez, but was soon afterward, in 1891, appointed by him Peruvian Minister to France and Spain. In 1894, upon the death of President Bermudez, the party of Cáceres seized the reins of government, Cáceres was proclaimed dictator and the Congress forced to elect him President. The ex-dictator, Piérola, however, disputed his right to the office and besieged the city, on 18 March 1895, after a bloody conflict, taking it. A treaty of peace was signed between the two parties, in which

Cáceres was obliged to resign the Presidency. He soon afterward fled and Piérola was elected President 10 July 1895. Upon the retirement of Romaña from the Presidency, Cáceres returned to his native land and again entered the political arena. He was sent as Envoy Extraordinary to Italy in 1905, and was assassinated 20 Nov. 1911.

CÁCERES, Spain, a town in Estremadura, capital of the province of the same name, 24 miles west by north of Truxillo. It consists of an old and a new town, the former crowning the top of a hill, and surrounded by a strong wall flanked with towers, and the latter built round it on the lower slopes. The houses are tolerably well built, but the streets are mostly narrow and steep. Among the objects worthy of notice are four churches, several old feudal mansions and the bull-ring. It is famous for its bacon, has manufactures of linen, woolens, hats, leather, soap, etc., and controls a large trade in the produce of the district. Pop. about 16,000. The province of Cáceres is the second largest of Spain, in the north of Estremadura, owned chiefly by large proprietors, and mostly devoted to cattle-raising; the north half is a good wine country. The area is over 8,000 square miles, and the population about 415,000.

CÁCERES NUEVA. See NUEVA CÁCERES.

CACHAR, kā-chăr′, a district of Assam, India, bounded east by Manipur and the Naga Hills, south by the Lushai Hills, west by Sylhet and the Jaintia Hills, and north by Nowgong district. It comprises a series of fertile valleys diversified by low hills and almost surrounded by mountain ranges. The Barak River flows through the district, its course here being about 130 miles. Lignite and petroleum have been found. Salt is manufactured in small quantities. The forests are of great extent, and constitute the chief natural wealth of the district. Rice and tea are extensively cultivated. Area, 2,472 square miles; pop. 467,300. The chief town is Silchar.

CACHE, kăsh, the name of (1) a river in Arkansas, flowing northwest about 150 miles into the White River, near Clarendon, Monroe County; (2) a peak of the Rocky Mountains in Idaho, height 10,451 feet; (3) a fertile valley in the Wasatch Mountains in Utah and Idaho. It is 60 miles long and from 10 to 20 miles wide, and has an altitude of 5,000 feet. It is watered by the Bear River, and has several villages, of which Logan is the largest.

CACHE, a hole in the ground for hiding and preserving provisions which it is inconvenient to carry; used by settlers or travelers in unsettled parts of North America and by Arctic explorers. In the case of the latter the caches are well marked so that they may be discerned from a distance. In pioneer days in the West the traders or explorers dug holes to a depth of several feet and in these placed the articles which they intended for their use on the return journey. The hole was next covered in and the surface replaced so as to leave no trace of any excavation. It was later found by means of some landmark, as a jutting rock, tree, bend in the stream, etc.

CACHEO, ka-shā′oo, or **CACHEU**, Portuguese Guinea, West Africa, a fortified town founded in 1588, and situated 10 miles inland on the Cacheu River. Ivory and gold dust are the principal articles of commerce. Pop. 15,000.

CACHET, Lettres de, lĕtr dė kă-shā′, a term formerly applied especially to letters proceeding from and signed by the kings of France, and countersigned by a Secretary of State. They were at first made use of occasionally as a means of delaying the course of justice, and appear to have been rarely employed before the 17th century as arbitrary warrant for the detention of private citizens, and for depriving them of their personal liberty. During the reign of Louis XIV their use became frightfully common, and by means of them persons were imprisoned for long periods, or for life, on the most frivolous pretexts. Sometimes, however, such arrests were favors on the part of the King, as they withdrew the accused from the severer punishment to which they would have been liable upon trial before the courts. *Lettres de cachet* were abolished at the Revolution.

CACHEXY, ką-kĕk′sĭ, or **CACHEXIA**, ką-kĕk-sĭ-ạ (Gr., «evil habit of body»), a morbid state of the bodily system, in which there is great weakness, with or without the local manifestation of some constitutional disease. It is not a disease of itself, but the result of diseases such as gout, cancer, lead-poisoning, tuberculosis, syphilis, intermittent fever, excessive use of alcohol, etc., each disease producing its particular modification of cachexia. Thus scrofulous cachexia means the condition of body due to scrofula, shown by slender form, narrow or deformed chest, pallor, diseased glands, large prominent joints, etc.

CACHOEIRA, ką-shwā′ę-rą, Brazil, town in the state and 62 miles northwest of Bahia. It stands on the Paraguassu, which divides it into two unequal parts and has often injured it by inundations, and is the entrepôt for the traffic of a large extent of surrounding country. Tobacco and cigars are manufactured, the best brand in Brazil being named from the suburb of Saint Felix. The chief exports are coffee, sugar, fruit, cotton and tobacco. Pop. 15,000.

CACHOLONG, kăsh′o-long, a mineral of the opal division of the quartz family. It is often called pearl-opal. It is usually milk-white, sometimes bluish or yellowish white, or reddish, opaque or slightly translucent at the edges. Its composition is of silica, like quartz, and its symbol is SiO_2. Some authorities add to the symbol $n\,H_2O$, to express a varying amount of water usually found in its composition. Other authorities regard the water content as not characteristic. It often envelops common chalcedony, the two minerals being united by insensible shades. It also associates with flint and semi-opal.

CACHOU, kă-shoo′, an aromatic sweetmeat in the form of a silvered pill, used for giving an agreeable odor to the breath.

CACHUCHA, kä-choo′chą, an Andalusian dance, resembling the *bolero*, performed to a graceful air in 3–4 time and with a strongly marked accent. It is usually danced with castanets, and was introduced on the stage by Fanny Elssler in the ballet of ‘Le diable boiteux.’

CACIQUE, kä-sēk′, or **CAZIQUE**, a title borne by, or a designation given to, the chiefs of Indian tribes in Central and South America, Cuba, Haiti, etc. The term was formed by the Spaniards from a native Haitian word. Among the Pueblo Indians of New Mexico, there are two tribal divisions — summer and winter. Different caciques preside over each. Their office has religious powers, chiefly; on them also devolves the appointment of the annual government officials. The caciques are appointed for life.

CAÇIQUE, one of several South American icterine birds, forming the genus *Cassicus*, and closely related to the Baltimore oriole. They are sometimes uniform black, sometimes black relieved by chestnut, yellow, green or scarlet; the bill is frequently white instead of the usual black or brown. The caçiques are noted for their intricately woven, pouch-like nests, composed of thin bark and grasses, several of which, sometimes a yard in length, hang from the outer twigs of a single branch of some large tree, usually overhanging the water, as an extra precaution of safety against monkeys and snakes.

CACODYLE, or **CACODYL,** kăk′ō-dīl, -dĭl (Gr., «having a bad smell»), in chemistry, a monad radical having the formula $As(CH_3)_2$, and known as dimethyl arsine oxide. It is of special interest to the chemist because it was the first radical known in which a metal or a metalloid (in this case, arsenic) is combined with an organic base. The compound $As_2(CH_3)_4$, which was discovered by Bunsen in 1837, and which can exist in the free state, is often called cacodyle, but it is more correctly known as dicacodyle since its molecule consists of two cacodyle radicals. Dicacodyle is obtained in the pure state by heating cacodyle chloride with zinc in an atmosphere of carbon dioxide, but a mixture of cacodyle oxide and dicacodyle (known formerly as Cadet's fuming liquid) may be obtained by distilling potassium acetate with an equal weight of arsenic trioxide. As thus prepared it is liable to spontaneous combustion. Mercuric oxide (HgO) converts both of the constituents of Cadet's liquid into cacodylic acid, $(CH_3)_2AsO(OH)$; and this, in turn, is converted into cacodyle chloride, $As(CH_3)_2Cl$, by the action of corrosive sublimate and fuming hydrochloric acid. Cacodyle oxide (known also as alkarsin) may be obtained in the pure state by distilling the chloride with an aqueous solution of caustic potash in an atmosphere of carbon dioxide. Dicacodyle is a colorless oily liquid, heavier than water, boiling at 338° F., very poisonous, and characterized by an intensely disagreeable smell suggestive of garlic. Dicacodyle is known to the chemist as tetra-methyl di-arsenid.

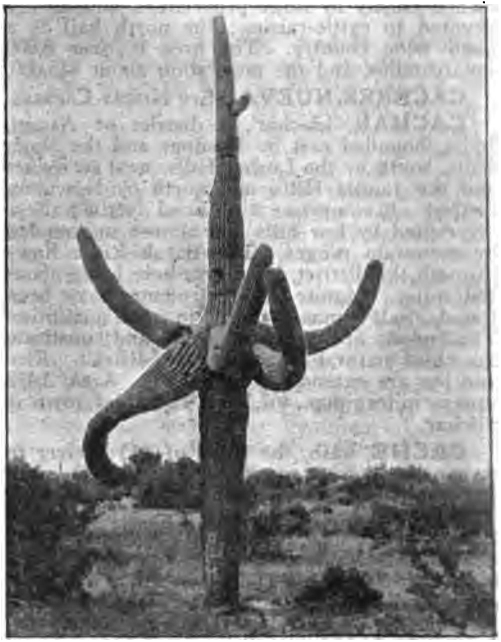
CACOMISTLE, kăk′ō-mĭs-ĕl, a small Mexican animal (*Bassariscus astutus*), closely related to the raccoon found in Mexico and neighboring parts of the United States. It is slender, about 16 inches long, with a sharp, fox-like face, large bright eyes surrounded with light patches, and erect ears. The long, soft fur is light brown above, darker along the back; the under parts are white, and the bushy tail has six broad white rings running around it. In habits it resembles the raccoon. It feeds on smaller mammals, birds and insects. It is frequently tamed by miners and is known to them as the American civet cat.

CACOMITE, kă-kō-mē′-tă, a plant in Mexico and Central America from which an edible flour is made. It is called in the Nahua tongue oceloxochitl (tiger flower) on account of the appearance of its very handsome and showy blossoms.

CACONGO, kä-kŏng′gō, or **KAKONGO,** a former district of Guinea, Africa, extending along the south Atlantic Ocean, in lat. 5° S., just north of the mouth of the Kongo. The Cacongo River enters the sea in lat. 5° 12′ S. This territory was claimed by the Portuguese, and Cabinda, the northern part of it, they still retain; the south and east of the Kongo have been absorbed in the Kongo Free State.

CACTACEÆ. See CACTUS.

CACTUS, the common name for all members of the family *Cactaceæ*, a group of dicotyledons, found in luxuriance in the arid sections of North and South America. Like the watermelon, they have the faculty of absorbing a vast bulk of water, making the stems most succulent.



Giant Cactus or Shuaro Cactus near Phœnix, Arizona.

The economic uses of the cacti are many, especially among primitive peoples. One or two species of the genus *Anhalonium* yield alkaloids which are used in medicine and which were known and used to produce intoxication by the Indians before the advent of the whites, and are still so used to a limited extent. The peculiar reticulations of the vascular or wood systems of many species render them very useful in the manufacture of art goods, otherwise known as curios in many sections. The various species are of most importance as articles of food for man and beast. In the semi-tropical and tropical regions of America a large group of the plants belonging to the genus *Cereus* and its allies furnish edible fruits known to the Spanish-American as *pitahayas*. These

[illegible]). 2. [illegible]
[illegible]s) 5. Wart-cactus [illegible]
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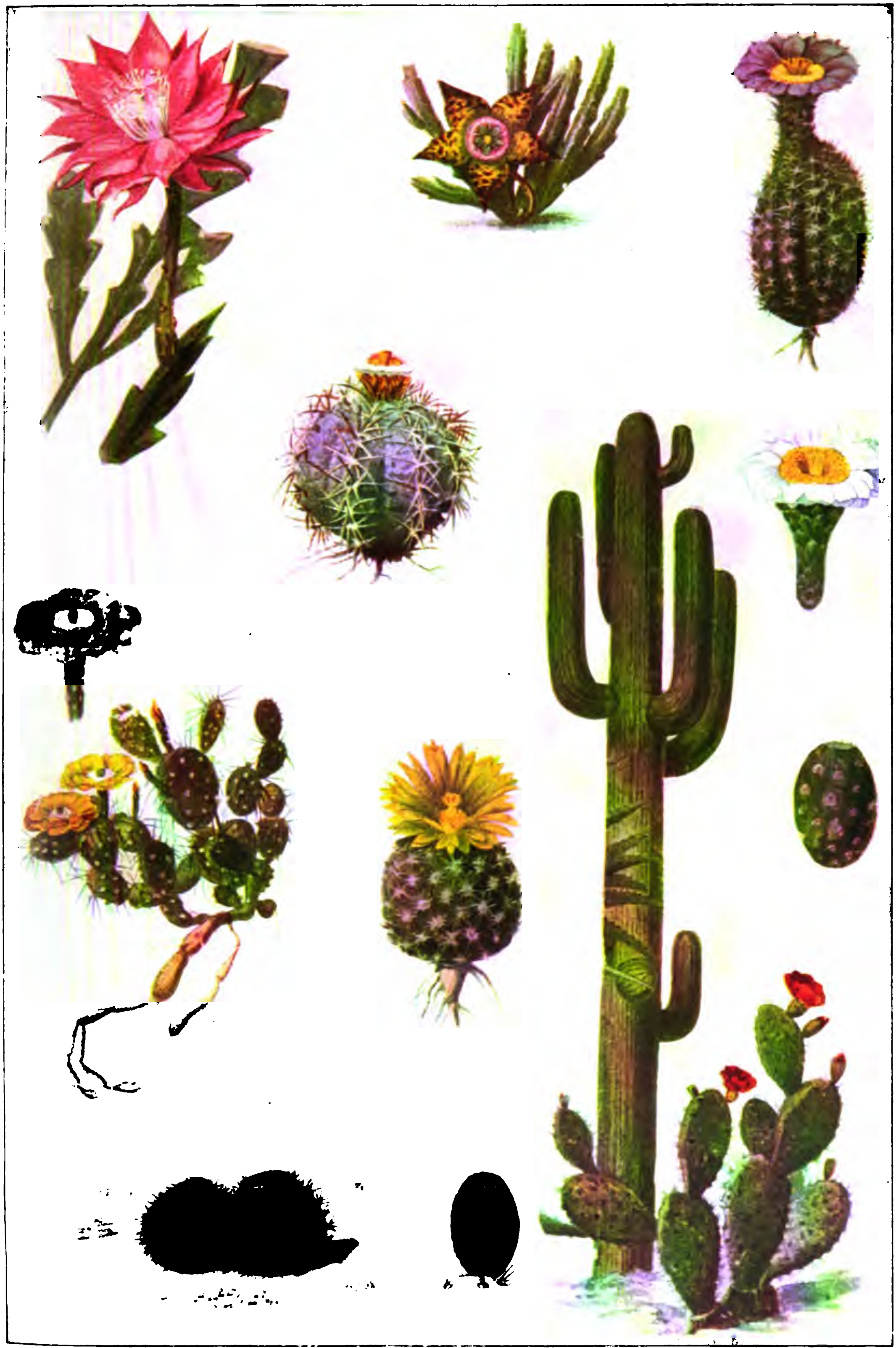
[illegible] Mexican Opuntia (O[illegible]

[illegible] Cactus [illegible], Ariz.

[illegible] people [illegible] [illegible] and [illegible] [illegible] of the [illegible] [illegible] render [illegible] [illegible] portions [illegible] beast. In the [illegible] of Arizona [illegible] pertaining to the [illegible] Spanish [illegible] known as pitahaya.

CACTUSES



1. Leaf-cactus (Phyllocactus anguliger). 2. Stapelia (simulating a cactus). 3. A Cereus (Cereus dasycanthus). 4. Globe-cactus (Echinocactus horizonthalonius). 5. Wart-cactus (Mammilaria pectinata). 6. Hairy Opuntia (Opuntia filipendula)—a, the blossom, enlarged. 7. Melon-cactus (Melocactus communis). 8. Giant Cactus (Cereus giganteus)—a, blossom, enlarged; b fruit, enlarged. 9. Mexican Opuntia (Opuntia coccinellifera)—a, the fruit ("prickly pear"), enlarged.

Flower of the Hedgehog Cactus

grow for the most part on tall, branching and columnar plants, similar to the familiar giant cactus (*Cereus giganteus*) of the Arizona desert. These fruits vary in size from three-fourths of an inch to two inches in diameter, depending upon the species. Along the Texas frontier forms grow which are known as Mexican strawberries to the English-speaking peoples.

By far the greater part of the fruit produced by this family of plants comes from the flat-jointed prickly pears belonging to the genus *Opuntia*, the fruits of which are known in Spanish America as *tunas*. Some of these are extensively cultivated throughout the highland region of Mexico as well as in the Mediterranean region of Europe, Asia and Africa. Prickly pears, although natives of the American continent and its continental islands, are now cultivated or have become naturalized throughout the tropical and subtropical regions of the world. The fruits are eaten raw, dried, and in the form of preserves. Their juices are also expressed and fermented into a drink called colonche. It is less common now than formerly to find a distilled drink made from the tuna because of the deleterious effects of tuna alcohol.

On account of their ability to absorb and retain large quantities of water, the cacti, especially the prickly pears, often become important to the stockmen in portions of our southwestern States. They remain green and succulent after other forage has dried up or become exhausted. The rancher then resorts to this rough feed to save his stock. He may singe the thorns off with a brush or, if his herds are large, he may singe them with a modified plumber's torch, or he may even chop the plants into small pieces and feed them in this way.

It is a common practice in southwestern Texas to feed prickly pear and cottonseed meal to stock during the winter. In the vicinity of San Antonio dairymen for a number of years have fed prickly pear to their dairy cows along with a liberal supply of grain and hay. Prickly pears furnish the succulence so essential in milk production and so difficult to obtain in a semi-arid region.

When driven to extremity travelers in the desert have been known to resort to these plants for water supply. The pulpy tissues, preferably of such forms as the barrel cactus (*Echinocatus*), are macerated to set the juices free. A rather unpalatable and somewhat purgative drink is thus obtained which relieves thirst in a measure. The candied flesh of the barrel cactus forms a palatable sweetmeat.

The flowers and stems of the night-blooming cereus (*Cereus grandiflorus*) have been used in medicine, in the form of a fluid extract, as a cardiac stimulant. Its action resembles that of digitalis, but is less uniform.

CACTUS WREN, a small wren (*Campylorhynchus brunneicapillus*) inhabiting the arid and desolate regions of the Mexican border. It is grayish brown above, darker on the head, nearly pure white beneath, with a spotted breast, and a white line over the eye. It makes a large flask-shaped nest of grasses and twigs, lined with feathers, and laid in the crotch of a cactus. This nest is entered by a covered way or neck several inches in length. It is a very sprightly bird with a clear, ringing song.

CACUS, in Roman legend, a huge giant, in some accounts a son of Vulcan, who lived in a cave on Mount Aventine. Having stolen and dragged into his cave some of the cattle which Hercules had carried away from Geryon in Spain, he was killed by that hero, who discovered his place of hiding by the lowing of the oxen within, in response to the lowing of the remainder of the flock as they were passing the entrance of the cave. The Ara Maxima was built by Evander to commemorate this victory. Consult Livy (Bk. I, 7) and Virgin, 'Æneid' (VIII, 184–279.).

CADA MOSTO, kä'dą mō'stō, or **CA DA MOSTO, Luigi da**, Italian navigator: b. Venice, about 1432; d. about 1480. In 1455 he departed from Lagos, sailed into the river Senegal, which had been discovered five years before, and after trading in slaves and gold he steered for Cape Verde, where he joined two other discovery ships, and visited, in company with them, the mouths of the Gambia, the riches of which had been greatly extolled. In 1456 Cada Mosto, in company with two other ships, made a second voyage to the Gambia. On the way thither they discovered the Cape Verde Islands. The description of his first voyage, 'Il Libro de la prima navigazione per l'oceano alle terre de' Negri della Bassa Etiopia, di Luigi Cada Mosto' (Vicenza 1507, and Milan 1519), the oldest of the voyages of the moderns, is a masterpiece. The arrangement is admirable, the narrative interesting, the descriptions clear and accurate.

CADAMBA, kȧ-dam'bą, or **KUDUMBA**, the wood of several species of *Nauclea*, an Indian genus of *Cinchonaceæ*. It is a wood of deep yellow hue, used locally in the manufacture of furniture. *N.* (*Uncaria*) *gambir* is the source of the dyestuff known commercially as gambir or gambier.

CADASTRAL SURVEY (F. *cadastre*, from It. *catastro*, from low Lat. *capitastrum*, «a register for a poll-tax»; Lat. *caput*, «the head»), a territorial survey in which objects are represented in their true relative positions and magnitudes. A cadastral survey differs from a topographical one, in not magnifying the principal objects. It requires consequently to be made on a larger scale than the topographical survey, so as to admit of a proportionally accurate representation of towns, houses, roads, rivers, etc. The scale on which the cadastral map of the United Kingdom is prepared, $\frac{1}{2500}$ of the linear measure of the surface surveyed, is an example of the scale of a cadastral survey. This scale corresponds with 25.34 inches to the mile. See SURVEYING.

CADDIS-FLY, the common name of any of the order *Trichoptera*, a group of aquatic insects, related to and by many supposed to be the ancestors of the moths and butterflies (*Lepidoptera*). They resemble the lower moths, but the wings are not scaled, except in a very rudimentary way. They differ from moths in having no true «tongue» or well-developed maxilla adapted for sucking the nectar of flowers, but as in moths the mandibles are either absent or obsolete. About 150 species are thus far known to live in North America. The larvæ are called «caddis-worms,» «case-worms,» or «cad-bait.» They are more or less cylindrical, with well-developed thoracic feet, and a pair of feet on the end of the abdomen, varying in length. The head is small, and like that of a tortricid larva, which the caddis-worm greatly resembles, not only in form, but in its habit of rolling up submerged leaves. They also construct cases of bits of sticks, sawdust or grains of sand, which they drag over the bottom of quiet pools, retreating within when disturbed. They live on vegetable matter and on water-fleas (*Entomostraca*) and small aquatic larvæ. When about to pupate they close up the mouth of the case with a grating, or, as in the case of *Helicopsyche*, which is coiled like a snail-shell, by a dense silken lid with a single slit, and in some instances spin a slight, thin, silken cocoon, within which the pupa state is passed. The pupa is much like that of the smaller moths, except that the mandibles are present, and wings and limbs are free from the body. After leaving its case it makes its way over the surface of the water to the shore, sometimes going a long distance. The female deposits her eggs in a double gelatinous, greenish moss, which is attached to the surface of some aquatic plant. Consult McLachlan, 'Monograph of the Trichoptera of the European Fauna'; Banks, 'A List, Synopsis, Catalogue, and Bibliography of the Neuropteroid Insects of Temperate North America'; 'Transactions of the American Entomological Society,' Vol. XIX; also a paper by Newham and Betten in 'Bulletin of the New York State Museum,' 47.

CADDOAN (kä'dō-ạn) **INDIANS**, a family of North American Indians, comprising the Arikari tribe in North Dakota; the four Pawnee villages, Grand, Tapage, Republican and Skidi, in the Indian Territory; and the Caddo, Kichai, Wichita and other tribes, formerly in Louisiana, Texas and Arkansas. The present number of these Indians is about 2,130, of which 416 are in North Dakota, the rest in the Indian Territory.

CADE, John (the Jack Cade of Shakespeare), Irish rebel: d. 11 July 1450. Early obliged to flee from Ireland, he took refuge in France. In 1450 he passed over to England at the moment of great popular dissatisfaction with the ministers of Henry VI. He at once pretended to be a relative of the Duke of York, assumed the name of Mortimer, raised the standard of rebellion in Kent, 8 May, and very soon found himself at the head of 20,000 men. He advanced to Blackheath, and interchanged notes with King Henry, to whom he made known the griefs of his companions. He defeated the royal troops which were sent against him, and entering London, 1 July, immediately caused the execution of two of the offensive ministers. At first he kept his army under rigorous discipline, but after a few days' residence in the capital their propensity to plunder could no longer he restrained, and they pillaged some of the finest houses. This aroused the citizens against them, and on the night of 5 July Cade met with his first defeat. A promise of pardon now dispersed most of his followers, and finding his force no longer sufficient for resistance he took to flight, was overtaken, offered resistance and, mortally wounded, was taken prisoner and died on his way to London. Consult Kreihn, 'The English Rising of 1450' (Strassburg 1892); Clayton, 'The True Story of Jack Cade' (London 1909).

CADELL, Francis, Scottish explorer in Australia: b. Cockenzie, Scotland, 1822; d. 1879. At the age of 14 he entered the service of the East India Company as midshipman and in 1844 was appointed commander. Becoming assured of the navigability of the Murray River in Australia he made an extended exploration of that stream in 1850. Subsequently forming a navigation company he reached by steamboat a point 300 miles from the river's mouth, and in 1858 explored the Murrumbidgee River, and in 1858 the Darling River as far as Mount Murchison. While in command of a vessel sailing from Amboyna he was murdered by his crew.

CADENCE, the concluding notes of a musical composition or of any well-defined section of it. See HARMONY.

CADENCY, in heraldry, a system of marks intended to show the descent of a younger branch of a family from the main stock. Modern heraldry recognizes nine marks of cadency; the first son bears the label; the second, the crescent; next in order come the mullet, the martlet, the annulet, the fleur-de-lys, the rose, the cross-moline and the octofoil.

CADENZA, in music, a flourish of indefinite form introduced on a bass note immediately preceding a close. Formerly the performer improvised his own cadenzas but after Schumann's tune all composers write out the cadenzas and do not trust to the improvisations of every performer.

CADER IDRIS, a mountain in Merionethshire, Wales, the beginning of a chain running northeasterly. The ridge is nearly 10 miles long, and with its breadth of from one to three miles makes an elevation of great massiveness. Its greatest height is 2,925 feet. It is about five miles southwest of Dolgelly, and there is a fine view of the Irish Sea from the summit.

CADET, kạ-dĕt', a word having several significations. It is of French origin, and was written *capdet* in the 15th century, from *capitetto*, little chief, inferior head of a family. Fr. pron. kä-dā'.

1. A younger son of a family; that is, one junior to the eldest or heir by primogeniture; the youngest son; a younger branch — or member of a younger branch — of a family. Thus the brothers Coquelin, the famous French actors, were described as Coquelin *aîné* and Coquelin *cadet*. The feminine forms are *aînée* and *cadette*.

2. In the former French military service — before the Revolution — a gentleman who entered the army without a commission and without pay to learn the military profession, as was regularly done by the younger sons of the nobility to find a career for themselves. This last was all the more necessary as the *droit d'aînesse*, which had prevailed in France since the 12th century, gave the whole inheritable estate to the eldest son, to the detriment of the younger ones. Since the decree of 15 March 1790, hereditary possessions are equally divided among all the children or their descendants, irrespective of sex and primogeniture.

3. A junior clerk in the old East India Company's service.

4. A student in a military or naval college or on a training ship. The body of students in the United States Military Academy at West

Point, N. Y., is known as the United States Corps of Cadets. They constitute part of the army, but are not officers. Graduates are commissioned as 2d lieutenants. The students in the United States Naval Academy at Annapolis; those of the Royal Military Academy at Woolwich, or the Royal Military College at Sandhurst, are termed cadets, or, in the French military sense, a young man designed to become an officer not by rising from the ranks, but by a course of special instruction to qualify him for the position. A midshipman is a naval cadet afloat. In Germany the cadet system is highly developed. The training ships are called Kadettenschiffe. Cadet schools and corps exist in all the other European armies and navies. The Japanese Cadet School in Tokio has a teaching staff of 239 and over 1,500 students. In China each provincial capital contains a primary military school, where pupils from 15 to 18 years of age undergo a three years' course, proceed to one of the Four Middle Schools for two years, followed by six months' practical training in the army and finish up with two years in the Military High School at Paotingfu.

CADETS DE LA CROIX, crwä, the early name by which the Camisards (q.v.) styled themselves, from a white cross they wore under their hats.

CADET'S FUMING LIQUID. See Cacodyle.

CADILLAC, kạ-dē-yäk, **Antoine de la Mothe,** French military commander: b. Gascony, France, about 1660; d. France 1720. He came of good family, and having entered the army was for some time captain in Acadia. In 1694 Frontenac placed him in command of Michilimackinac, where he remained until 1697. Cadillac then brought to the attention of Louis XIV a well-considered scheme for a permanent settlement and trading post in the Northwest. On receiving the monarch's approval he founded Detroit in 1701, establishing 50 soldiers and 50 settlers at that point. From 1712 to 1717 he was governor of Louisiana, returning to France in the year last named. The town of Cadillac, Mich., was named in his honor. Consult Burton, 'Cadillac's Village, a History of the Settlement, 1701–10' (1896); Parkman, 'A Half Century of Conflict' (Boston 1892).

CADILLAC, Mich., city and county-seat of Wexford County, on Little Clam Lake, and on the Grand Rapids and Indiana and the Ann Arbor railroads, 98 miles north of Grand Rapids. It was founded in 1871, incorporated in 1874, and since 1914 has been under the commission manager plan of government. The principal buildings comprise city hall, county courthouse, public library and hospital. Besides the lumber interests of a valuable hardwood timber region, it has veneer, table, chair and shoe last factories, chemical works and machine shops. Pop. 8,375.

CADIZ, Ohio, village and county-seat of Harrison County, about 25 miles northwest of Wheeling, W. Va., and 120 miles east-northeast of Columbus, on the Pittsburgh, Cincinnati and Saint Louis Railroad. Cadiz is important as a banking centre and has a large trade in coal, gas, poultry, oil and wool. It was the home of Edwin M. Stanton (q.v.). Pop. 1,971.

CADIZ, kä'dĕth or kạ-dĭz (anciently Gades), a seaport and one of the handsomest cities in Spain, 95 miles south-southwest of Seville by rail, is situated at the extremity of a long tongue of land projecting from the Isla de Leon, off the southwestern coast of Andalusia. The narrowness of the land communication prevents its capture by a military force while the garrison is master of the sea. It is walled, with trenches and bastions on the land side; the houses are high, and the streets narrow. The chief buildings are the great hospital, the custom-house, the old and new cathedrals (with pictures by Murillo), two theatres, the bull-ring, capable of accommodating 12,000 spectators, and the lighthouse of Saint Sebastian. From the harbor the town presents a magnificent appearance. The Bay of Cadiz is a very fine one. It is a large basin enclosed by the mainland on one side, and the projecting tongue of land on the other. It is from 10 to 12 leagues in circumference, with good anchorage and protected by the neighboring hills. It has four forts, two of which form the defense of the grand arsenal, La Caracca, in which are 3 basins and 12 docks. The city touched its greatest prosperity after the discovery of America, when it became the European emporium for the New World. The loss of the Spanish colonies in America dealt it a heavy blow; but within recent years it has made rapid strides despite the imperfect drainage and a bad water supply which are responsible for the high death rate of 44 per 1,000. Cadiz has long been the principal Spanish naval station. It was the centre of the Spanish-American trade, and the commerce of the port was very extensive before the separation of the colonies. The preparation of salt from pits belonging to the government was formerly an important branch of industry, but is now of comparatively little consequence. The manufactures of Cadiz are of comparatively little importance, but in regard to the extent and value of its commerce it ranks as one of the first ports in Spain. Its imports consist of all kinds of foreign and colonial produce, coal, cotton and woolen manufactures etc.; its exports of wines, fruits, oils and other products of Spain. The town of Santa Maria, opposite Cadiz, is the principal depot of the wines of Xeres. Cadiz was founded by the Phœnicians about 1100 B.C., and subsequently belonged in succession to the Carthaginians and the Romans. Long in possession of the Moors, it was captured from them in 1202 by Alfonso X of Castile. In 1587 Sir Francis Drake destroyed the Spanish fleet in the bay; and it was taken by the Earl of Essex in 1596 and from its bay Villeneuve sailed previous to the battle of Trafalgar in 1805. In 1809 it became the seat of the central junta, and afterward of the Cortes. It sustained a long blockade from the French (1810–12), which was not raised till after the battle of Salamanca. In 1823 the French entered it after a short siege. The Spanish revolution of 1868 originated in Cadiz. Pop. 67,174.

CADMAN, Samuel Parks, American Congregational clergyman and author: b. Wellington, Shropshire, England, 18 Dec. 1864. A graduate of London University (Richmond College), after he came to the United States, he received the degree of D.D. from Wesleyan and Syracuse universities, 1898; S.T.D., Columbia University, 1913; D.H.L., University of Vermont, 1913. He was pastor of the Metropolitan Temple, New York, from 1895 to 1900, when he accepted a call to the Central Congregational Church, Brooklyn. Previously a trustee, he became acting president of Adelphi College in 1913–14. Well known as a public speaker and lecturer, he is author of 'Charles Darwin and Other English Thinkers' (1911) and 'Three Great Oxford Movements' (1915).

CADMEA, the name given to the acropolis of Thebes, Bœotia, because it was said to have been founded by Cadmus. Only fragments of its walls remain.

CADMIA, a name used by early writers (1) for the mineral calamine (q.v.); and (2) for the sublimate of zinc oxide that often collects on the walls of furnaces used in the reduction of metallic ores, when those ores happen to contain zinc.

CADMIUM, a metallic element resembling zinc in its chemical properties, and discovered by Stromeyer in 1817, in a specimen of zinc carbonate. Cadmium often occurs in ores of zinc to a small extent, blende sometimes containing as much as 3 per cent of cadmium sulphide. The commercial supply of the element is obtained as a by-product in the smelting of zinc, chiefly in Belgium and Silesia. Cadmium sulphide also occurs native as the mineral greenockite (q.v.), otherwise known as «cadmium blende.» In the distillation of zinc ores the cadmium, being more volatile, passes over first; and advantage is taken of this fact for the isolation of the metal in the arts. In Silesia, where the zinc ores often contain considerable quantities of cadmium, the first portion of the distillate is likely to contain as much as from 3 to 10 per cent of cadmium. This is mixed with coal or charcoal and redistilled at a low, red heat. Cadmium, mixed with a little zinc, passes over; and by one more distillation the metal is obtained in a fairly pure form. To eliminate the last traces of zinc, the crude metal is dissolved in hydrochloric acid, then diluted and precipitated as a sulphide by a current of sulphuretted hydrogen. The sulphide is then dissolved in concentrated hydrochloric acid, and the subsequent addition of carbonate of soda precipitates the carbonate of cadmium, which is reduced to the oxide upon ignition. The pure oxide thus obtained may then be reduced to the metallic form by distillation with charcoal.

Metallic cadmium is lustrous and resembles tin in appearance, though it has a bluish tinge. It is stronger than tin, but, like that metal, it emits a peculiar crackling sound, or «cry,» when bent. At ordinary temperatures it is quite ductile and malleable, and may be drawn into thin wire, rolled into thin sheets, or hammered into foil. At about 175° F. it becomes brittle, however, so that it can be pulverized in a mortar. Cadmium has the chemical symbol Cd. Its specific gravity is about 8.65. It melts at 600° F., and boils at about 1,500° F., yielding a yellow vapor. Its atomic weight is 112.4 if $O = 16$, or 111.6 if $H = 1$. Its specific heat is about 0.055, and its linear coefficient of expansion is about 0.0000185 per Fahrenheit degree. Metallic cadmium is used to a limited extent in the preparation of alloys, its general effect being to reduce the melting-point of the alloy to which it is added. The total production of the metal per annum is probably about two tons.

In its chemical relations, cadmium, like zinc, is a dyad. Metallic cadmium undergoes a slow, superficial oxidation upon exposure to the air; and when sufficiently heated in the presence of air it oxidizes rapidly and may even take fire. The resulting oxide, CdO, is brown in color and readily dissolves in acids, with the production of the corresponding cadmium salts. One of the best known of these salts is the iodide, CdI_2 which is used in photography and in medicine, and may be obtained by the action of hydriodic acid, HI, upon cadmium carbonate, or metallic cadmium. The bright yellow sulphide, CdS, is formed when the stream of sulphuretted hydrogen gas is passed through a slightly acid solution of a cadmium salt; and this fact is used in the detection and isolation of cadmium in qualitative analysis. The sulphide is used as a pigment, under the name of «cadmium yellow»; it is brilliant in color, and does not change upon exposure to air or light.

CADMUS, in Greek mythology the son of Agenor and grandson of Poseidon. With his brothers he was sent by his father to seek for his sister, Europa, who had been carried away by Zeus, and he was not to return without her. After several adventures, the oracle at Delphi commanded him to desist from further search, to entrust himself to the guidance of a heifer, and where she should stop to build a city. He accordingly went to Bœotia, where he wished to sacrifice the cow to Athena. But his companions, attempting to bring water from the fountain of Ares for the purpose of the sacrifice, were slain by the dragon that guarded it. Cadmus killed the dragon, and, at the command of Athena, sowed its teeth in the earth; armed men immediately sprang up, whom he called Sparti (the sowed), but who perished in a contest with each other, excepting five. With the remainder he built the city of Cadmea or Thebes (see THEBES). He became by his marriage with Harmonia the father of Antinoe, Ino, Semele, Agave and Polydorus. After ruling for a time the city which he had built, and the state which he had founded, he proceeded, at the command of Bacchus, with Harmonia to the Enchelæ, conquered their enemies, the Illyrians, became their King, and begat another son, Illyrius. Tradition states that Cadmus came to Bœotia from Phœnicia, 1550 B.C., conquered the inhabitants who opposed him, and, in conjunction with them, founded the above-mentioned city. To promote the improvement of his subjects he taught them the Phœnician alphabet, the employment of music at the festivals of the gods, besides the use of copper, etc. Another Cadmus, of Miletus, a son of Pandion, was regarded among the Greeks as the first who wrote in prose. He lived about 600 B.C.

CADOL, Victor Edouard, vēk-tōr ĕd-oo-ärd kạ-dōl, French dramatist and novelist: b. Paris, 11 Feb. 1831; d. 1898. He was long prominent as a journalist, being on the staff of *Le Temps,* and was one of the founders of *L' Esprit Français.* Among his very numerous works, many of which were written in collaboration, are 'La Germaine,' a three act

COUNT GENERAL LUIGI CADORNA

Commander-in-Chief of the Italian armies (1915-17)

comedy (1864); 'Les ambitions de M. Fauvelle' (1867), which ran for over 200 consecutive nights; 'Les Inutiles' (1868); 'La Belle Affaire' (1869); 'La fausse monnaie' (1869); 'Paris pendant le siège' (1871); 'Le spectre de Patrick' (1872); 'Mariage de princesse' (1888); 'Thérèse Gervais' (1893); 'L'archiduchesse' (1897). A corrected edition of his dramas appeared in 1897 entitled 'Théâtre inédit.' Among Cadol's romances are 'Contes gais' (1867); 'Le Monde galant' (1873); 'Madame Elise' (1874); 'Rose' (1875); 'La Grande Vie' (1879); 'Son Excellence Satinette' (1882); 'La Belle Virginie' (1883); 'Tout Seul' (1884); 'Lucette' (1886).

CADORE, kä-dō'rā, or **PIAVE DI CADORE**, a town of Italy, in the province and 22 miles north-northeast of the town of Belluno, on the Piave, derives its chief interest from being the birthplace of Titian.

CADORNA, kă-dôr-nă, **Luigi**, COUNT, Italian general, son of General Count Raffaele Cadorna: b. Pallanza 1850. After receiving his early education at a cadet school he passed the Staff College and was attached to his father's staff in 1870 when the latter — a brilliant soldier — led the Italian army into Papal territory in 1870 and blew in the Porta Pia. He attained the rank of captain in 1875, and was ultimately appointed chief of staff of the Verona Army Corps. After commanding the 10th Bersaglieri he was promoted major-general in 1898 and lieutenant-general in 1905. For a time he commanded a division at Ancona and was subsequently appointed corps commander at Genoa, with the rank of commander-designate of an army in the field. In 1914 he succeeded General Pollio as chief of the general staff. His reputation as a professional soldier had long been established throughout Europe, for he had written works on military science and possessed a unique knowledge of that difficult *terrain* in which, if ever, Italy would be called upon to fight her old enemy and quondam ally Austria. When Italy entered the war in May 1915 Count Cadorna was given the supreme command in the field. His battle front of about 480 miles was the most difficult one in Europe, presenting enormous geographical obstacles, the angle of the Trentino, the great wall of the Dolomites and the Carnic and Julian Alps. The Italian successes of 1916, including the capture of Gorizia, were neutralized by the great Austro-German drive against Italy that began on 23 Oct. 1917. By the evening of the 28th the whole Italian line was in retreat and General Cadorna fell back upon the Tagliamento. Gorizia fell to the enemy and Udine was lost. The mountain defenses in the Carnic Alps began to crumble and the disaster soon extended to Cadore. Abandoning the Tagliamento lines on 5 November Cadorna fell back upon the Piave after an unsuccessful attempt to hold the Livenza. The Italian losses were estimated by the enemy at 250,000 men and 2,300 guns, and the Allies suffered a defeat in the field unparalleled in the war. French and British troops were rushed to the scene, but the Italians recovered themselves by their own efforts and made a firm stand on the Piave. On 9 Nov. 1917, a Supreme Political Council of the Allies for the whole of the western front was created, and General Cadorna was appointed a member of the permanent central military committee. On 10 Feb. 1918 Cadorna was succeeded as a member of the Supreme War Council by Gen. Gaetano Giardino. He was succeeded in his command by General Diaz. See WAR, EUROPEAN — AUSTRO-ITALIAN CAMPAIGN.

CADORNA, Raffaele, Italian general: b. Milan 1815; d. Turin, 6 Feb. 1897. He served in the Crimean War, and in 1860 was made war minister in Tuscany's provisional government, and military commandant of Sicily in 1866. He suppressed the Bourbon insurrection in Palermo in the latter year, and in 1870 captured Rome and was its military governor for a time. In 1871 he entered the Italian Senate. He was the author of 'Osservazioni sull' amministrazione centrale della guerra' (1854); 'Bibliografia delle campagne per l'independenza italiana' (1882), and 'La liberazione di Roma nel 1870' (1889).

CADOUDAL, Georges, kā-doo-dąl', French Chouan chief: b. Brittany, 1 Jan. 1769; d. Paris, 25 June 1804. In the protracted and sanguinary contests between the Royalists and Republicans during the French Revolution, the Chouans and Vendéans were the most resolute supporters of the Royal cause; and the energy and ability of Cadoudal soon raised him to an influential place among the adherents of the house of Bourbon. At this time attempts were made by Napoleon to gain over Cadoudal to the cause of the republic, and a lieutenant-generalship in the army was offered as the price of his submission; but he firmly declined all these overtures. He afterward engaged, in concert with General Pichegru and others, in a conspiracy having for its object the overthrow of the consular government and the restoration of the monarchy; which being discovered, Cadoudal was arrested and executed. Consult Georges de Cadoudal, 'George Cadoudal et la Chouannerie' (Paris 1887).

CADUCEUS, ką-dū'sę-ŭs, the staff considered as a symbol and attribute of the Greek god Hermes and the Roman god Mercury. It is generally represented as having two serpents twined around it in opposite directions, their heads confronting one another. It is probable that the staves carried by heralds and public criers gave rise to this fable, the fluttering ribbons or fillets tied to the end of the staff, or the green wreaths or boughs which were tied around it, giving the suggestion of the presence of living serpents. Several different fables were invented by late Greek writers to account for the serpents in a miraculous way. The fable tells that Apollo gave his staff to Mercury in consideration of his resigning to him the honor of inventing the lyre. As Mercury entered Arcadia with this wand in his hand he saw two serpents fighting together; he threw the staff between them, and they immediately wound themselves around it in friendly union. The caduceus is Mercury's peculiar mark of distinction. With this he conducted the shades to the lower world, and from it received the name of Caducifer; yet we find it on ancient coins in the hands of Bacchus, Hercules, Ceres, Venus and Anubis. Among the moderns it serves principally as an emblem of commerce over which Mercury was the presiding divinity.

CADWALADER, kăd-wŏl'ă-dėr, **George,** American lawyer and soldier: b. Philadelphia 1804; d. there, 3 Feb. 1879. He practised law till 1846; was made brigadier-general of volunteers; and was brevetted major-general after Chapultepec. He resumed his law practice till 1861; became major-general of State volunteers; was placed in command at Baltimore; accompanied Patterson's expedition to Winchester (1861); and, as one of a military board, directed the United States army operations. He was author of 'Services in the Mexican Campaign of 1847' (1848).

CADWALADER, John, American soldier: b. Philadelphia, 10 Jan. 1742; d. Shrewsbury, Pa., 10 Feb. 1786. At the outbreak of the Revolution he was placed in command of a battalion and soon became brigadier-general. He fought at Trenton, Brandywine, Germantown and Monmouth. In 1777 he organized the militia of eastern Maryland. In 1778 he challenged and wounded Gen. Thomas Conway for plotting against Washington. He published 'A Reply to Gen. Joseph Reed's Remarks' (1783). Subsequently, he became a member of the Maryland legislative assembly.

CADY, J. Cleveland, American architect: b. Providence, R. I. He entered the profession of architect in 1870 and among his noteworthy buildings are the American Museum of Natural History, the Metropolitan Opera House, the Brooklyn Art Association, various collegiate structures at Yale, Williams, Trinity and Wesleyan, and numerous churches, hospitals, mansions, commercial buildings, etc., throughout the country. Trinity College conferred on him the degree of M.A. in 1880 and LL.D. in 1905.

CÆCILIAN, sē-sĭl'ĭ-ạn, a member of a family of batrachians, the *Cæciliidæ,* regarded as forming an order, called Apoda, or Gymnophiona. They are long, worm-like animals, lacking all traces of limbs, and having only a rudiment of a tail. There may be as many as 250 vertebræ. The hinder end is blunt and hardly to be distinguished from the head. The body is covered with a soft, moist skin, and the jaws are armed with rather feeble teeth. These animals are found in the tropical parts of America, Africa and Asia, where they burrow like earth-worms, which they resemble. They are often found in the nests of ants, which they devour. They also feed on worms. The breeding habits of these creatures are not well understood. The eggs are laid either in the water or near it. One species found in Ceylon lays a mass of eggs which are connected by a cord, thus resembling a string of beads. They are deposited in a burrow near the water, and are incubated by the mother until the escape of the young. About 30 species of these animals are known.

CÆCILIUS, sē-cĭl'ĭ-ŭs, **Statius,** Roman comic poet and dramatist. He was born in Gaul of the race of the Isurbians; d. 166 B.C. His contemporaries ranked him with Plautus and Terence. He wrote over 40 comedies of which fragments remain. He was brought to Rome as a prisoner of war, but was freed. He was a friend of Ennius. Volcacius Sedigitus ranks him first among the comic poets of Rome. A few fragments have been preserved, mainly by Cicero and Aulus Gellius. Consult Ribbeck, 'Comicorum Romanorum Fragmenta' (Leipzig 1898).

CÆCULUS, sĕk'ū-lŭs, in mythology, a son of Vulcan, and a great robber, who lived in Italy, and built Præneste; but being unable to find inhabitants he employed the aid of Vulcan, his father, who populated the city for him.

CÆCUM, sē'kŭm (Lat. cæcus, blind), or caput coli (head of the colon), a blind pouch into which the small intestine empties. In the human body it is so small as to be practically useless; but the vermiform appendix begins in it as does also the colon. However, the cæcum is quite large in many of the mammalia, and serves the purpose of the retention of the food for a longer period than would be possible without it. It is therefore inclined to be larger in herbivorous animals; but it is lacking in some animals, like the bear, which would seem to require it; and omnivorous or granivorous birds have two cæca generally large, while fishes have no true cæcum and in reptiles the cæcum is small. The cæcum aids the digestion in the mammalia by the secretion of a fluid resembling gastric juice.

CÆCUM, Diseases of. Acute disease of the cæcum is usually present in the form of appendicitis (q.v.). Tuberculosis of the cæcum and cancer of the cæcum are described under the terms cancer and intestinal tuberculosis. The chronic diseases of the cæcum may be arranged under the headings, chronic catarrhal inflammation, atony of the cæcum with dilatation, spasm of the cæcum, displacements, and the neuroses of the cæcum. In some respects the cæcum may be thought of as a secondary stomach. Like the stomach, it is a dilated organ at the end of a portion of the intestinal canal, hence its disorders run in a sense parallel to those of the stomach. It is a food pouch which contains a quantity of food ready to be absorbed.

Atony of the cæcum is a not infrequent cause of serious disturbance and is due either to a general body loss of tone, as from wasting disease, from neurotic disturbances, from displacements or from mechanical obstructions. Certain clinicians regard the neurotic disposition or constitution as the most frequent, others regard the mechanical factors to be the most important. Atony may be present alone or be associated with dilatation, which latter is the more frequent.

The symptoms are complex and at times obscure. They are frequent in young adults, usually between 25 and 45. Obstinate constipation is a prevailing state. This is interspersed or broken into, as it were, by paroxysmal attacks of griping pain. These may last a few hours. At times there are simply periods of severe discomfort, with feeling of fullness in the right iliac fossa. Loss of appetite with at times nausea and vomiting are present. Examination of the abdomen reveals a fullness and resistance; there is frequent ileo-cæcal gurgling of gases and percussion of the area reveals a greater or less area of tympanites. Diarrhœa is not infrequent during the attacks. X-ray pictures are important in the diagnosis as it is frequently misinterpreted as a chronic appendicitis — which latter condition often accompanies the chronic cæcal atony and dilatation. The treatment is by rest, the knees drawn up, hot applications and belladonna. If the pain is severe, high soapsuds enemata are of value. Operation is rarely called for; the chief general treatment should consist in raising the general muscular tone of the individual. Setting up exercises with special attention devoted to the morale of the abdominal muscles is the best treatment. A vigorous attitude will give rise to a "strong-minded intestine" and do much to relieve the flabbiness and loss of muscular tone of these individuals. They are for the most part people who are chronically sorry for themselves and are usually internally indolent although at times externally fairly active.

Typhlospasm is the name given to an opposing type in which increased tone of the cæcum gives rise to a chronic spastic state of the organ. This is found in young adults usually of the more forceful and busy type. Here pain and discomfort are felt and there is a tendency toward increased frequency of bowel movement, two to three small dryish movements a day. The movement usually does not seem to relieve the patient. There is a sense of something left behind. Mucus and blood are sometimes passed, and the entire colon seems in a tense, full, uneasy state. This type of individual is usually forceful, overaggressive, choleric and impatient. They are frequently haters and often not well socially adjusted, often intensely avaricious and envious. The treatment is largely psychical. Belladonna, chloral and bromides are of value in tiding over the acute periods of distress. A prevailing trend in neurological medicine is to regard these conditions as largely of mental origin in which the mechanical factors, Lane's kinks, etc., are contributing causes.

CÆDMON, kăd'mŏn, the first Anglo-Saxon poet: d. 680. According to Bede's ‘Ecclesiastical History’ Cædmon was a swineherd to the monks of Whitby, and never gave evidence of any poetical talent until one night a vision appeared to him, and commanded him to sing. When he awoke, he found the words of a poem in praise of the Creator of the world impressed upon his memory. This manifestation of talent obtained for him admission into the monastery at Whitby, where he continued to compose devotional poems. An edition of his paraphrase of parts of the Scriptures was printed at Amsterdam in 1655, edited by Junius. Thorpe published an edition of it (London 1832) for the Society of Antiquaries. It has been assumed by some that Milton took some ideas of ‘Paradise Lost’ from the poems of Cædmon. It is certain that they were very popular among the English and the Saxon part of the Scottish nation, and furnish plentiful materials to the makers of mysteries and miracle plays. In the Bodleian Library at Oxford is a manuscript the contents of which are ascribed to Cædmon, but the best authorities do not consider it to be his. Consult Ten Brink, ‘Early English Literature’; Morley, ‘English Writers,’ Vol. II (1888); and the bibliograph in the "Cambridge History of English Literature."

CÆLIUS, sē'lĭ-ŭs, **Aurelianus,** Latin physician, generally supposed to have been a native of Numidia, and to have flourished in the 4th or 5th century of the Christian era. He was a member of the sect of the Methodici, and the author of ‘Medicinales Responsiones,’ a compendium of the whole science of medicine in the form of a catechism ‘Libri Quinque Tardarum Chronicarum Passionum’ and ‘Libri Tres Celerum sive Acutarum Passionum.

CÆLIUS MONS, one of the seven hills on which Rome was built. It is said to have received its name from Cælius Vibenna, an Etruscan, to whom it was assigned. The palace of Tullus Hostilius was on this mount. It is at present covered with ruins.

CAEN, kän, France, town in the department of Calvados, and the ancient capital of Normandy, 125 miles northwest of Paris, and about nine miles from the mouth of the Orne, which is here navigable and crossed by several bridges. There is a dock connected with the sea by both river and canal. Caen is the centre of an important domestic trade, the market of a rich agricultural district, and carries on extensive manufactures. The streets are broad, regular and clean, the houses well built of white freestone and it possesses various ancient and remarkable edifices. The public promenades and recreation grounds are beautiful, and there are various extensive squares and "places." The church of La Trinité, a fine edifice in the Norman-Romanesque style, restored in modern times, was formerly the church of the Abbaye-aux-dames, founded in 1066 by Matilda, wife of William the Conqueror. The church of Saint Stephen was founded at the same time by William the Conqueror as the church of the Abbaye-aux-hommes, and though considerably modified since is a noble and impressive edifice. It has two fine western towers 295 feet high. The Abbaye-aux-hommes, built by the Conqueror, who was buried in it, is now used as a college, having been rebuilt in the 18th century. One of the finest churches in Caen is that of Saint Pierre, whose tower (255 feet), terminated by a spire, is exceedingly elegant. Among other public buildings are the Hôtel de Ville, the prefecture and the palace of justice. Caen possesses a university faculty or college, a public library with some 100,000 volumes, a gallery of paintings with valuable works of old masters, a natural history museum, an antiquarian museum, etc. The hospital of the Abbaye-aux-dames is one of the best regulated in France. The hospital of the Bon-Sauveur is another admirable institution. The city was formerly fortified, and there are remains of a castle begun by William the Conqueror and finished by Henry I, but since much altered and now used as barracks. Caen first rose into importance in the time of William the Conqueror. In 1346 it was taken by Edward III, at which time it was said to be larger than any city in England except London. Henry VI of England founded a university here in 1431, Caen having been in the possession of the English from 1417 to 1450. It suffered much in the religious wars between the Protestants and the Roman Catholics of France. Admiral de Coligny captured it for the Protestants in 1562. Caen carries on shipbuilding, and its manufactures embrace linen, woolen and cotton goods, lace, ropes, metal goods, leather, cutlery and various other articles and has foundries, breweries, dyeworks and sawmills. It is also famed for gloves made from the skins of the Angora rabbits. It carries on a considerable trade in timber, iron ore, coal, grain and other articles, including agricultural produce exported to England, to which also is still exported the Caen building stone famous for many centuries. A canal connects the port with the sea. Maherbe, Laplace, Eeie de Beaumont and Auber were born in this city or in its vicinity, and are commemorated by statues. Pop. 46,934.

CAEN-STONE, a cream-colored oolitic limestone from Caen in Normandy, identical with the Bath oolite of England. It is easily carved and has long been highly esteemed as a building stone. Westminster Abbey, Canterbury Cathedral and other English churches are built of it. It is quarried underground in blocks nine feet long, two feet thick. Its amorphous nature prevents its use on external structures in severe climates. Its principal use is for interior work.

CÆNOTHERUM. See RUMINANTS.

CÆNOZOIC. See CENOZOIC.

CAERNARVON, kär-när'vŏn. See CARNARVON.

CÆRULARIUS, Michael, Greek ecclesiastic, the Patriarch of Constantinople, 1043–49. By dispensing with the Latin ritual in many churches of Bulgaria and protesting against the use of unleavened bread by the Latins in the Eucharist, he completed the division between the Latin and the Greek communions. He was formally excommunicated by Pope Leo IX. Some decretals and letters issued by him are still preserved. Consult Pichler, ‘Geschichte der kirchlichen Trennung zwischen dem Orient und Occident’ (Munich 1864).

CÆSALPINIACEÆ, sĕs-ăl-pĭn-ĭ-ā'sē-ē, a family of plants containing numerous genera. The botanical characteristics of the family are: Calyx of five divisions, joined together at different points, or often distinct to the base, with prefloration imbricate or valvular; petals equal or fewer in number; stamens often not symmetrical to the other parts of the flower, or very irregular, sometimes very numerous, sometimes partly abortive, rarely regular, very often free, or lightly joined together at the base only; ovary raised on a free support, or joined in part to the calyx and becoming legumes, which sometimes contain only one or two ovules, and of which the pericarp may have a fleshy consistence; seeds without perisperm; embryo often straight; stems often arborescent or fruticose, sometimes creeping; leaves simple, or more frequently compound, in the latter case frequently bipinnate. The typical genus is *Cæsalpinia*. The family contains many plants of great economic importance.

CÆSALPINUS, Andreas, or ANDREA CESALPINO, Italian physiologist: b. Arezzo, Italy, 1519; d. 23 Feb. 1603. He is first mentioned in public life as a professor of botany in the University of Pisa. He was subsequently made chief physician to Clement VII, and lived during the remainder of his life at Rome. He published works on botany, mineralogy, medicine and the highest questions of philosophy. In his first publication, entitled ‘Speculum Artis Medicæ Hippocraticum,’ his knowledge of the system of the circulation of the blood is stated in the clearest manner. The following passage is taken from the second chapter of its first book: «For in animals we see that the nutriment is carried through the veins to the heart as to a laboratory, and its last perfection being there attained, it is driven by the spirit which is begotten in the heart through the arteries and distributed to the whole body.» The system accepted since the time of Harvey could hardly be more definitely or accurately stated. His philosophical speculations are contained mainly in his ‘Quæstiones Peripateticæ.’ The philosophy of Cæsalpinus was scholastic Aristotelianism, with a leaning toward some of the methods and doctrines of the later transcendental or absolute systems. He reduces the world to the simplicity of two only substances, God and matter, and he makes all finite intelligences, all human, angelic and demoniac souls, to belong to the latter element. Two things are remarkable about his system: (1) The boldness of speculation, unparalleled in his age, with which he seeks a purely scientific view of the universe; and (2) its entirely materialistic character. But more important than either his anticipation of Harvey's discovery, or his speculative opinions, were his botanical labors. He was styled by Linnæus the first orthodox or systematic botanist, and his work ‘De Plantis,’ was a handbook to Linnæus in all his classifications. Botany in the time of Cæsalpinus was the popular witchcraft: as a science, it consisted in a mass of erudition about the imaginary but marvelous virtues of plants. Cæsalpinus sought successfully to transfer it from the realm of magic to that of science. He proposed the basis of classification upon which the whole system of Linnæus rests, namely, the distinction of plants in their parts of fructification. He lived quietly to an old age at Rome, submitting all his speculations to the supremacy of the Church, and presenting in his life an example of every virtue.

CÆSAR, the name of a patrician family of the Julian gens, tracing its origin to Julius, the son of Æneas. The first member of the family who occurs in history with the surname of Cæsar was Sextus Julius Cæsar, prætor, 208 B.C. Cæsar was the family name of the first five Roman emperors. With Nero the imperial family became extinct (68 A.D.), and Cæsar became merely a title of dignity. The Emperor, who bore the title of Augustus, appointed his successor, with the title of Cæsar. On medals and monuments we find the title Cæsar preceding the name of the emperor, as «Imp. Cæsar Nerva Trajanus Augustus,» and following that of the designated successor, as «Marc. Aurel. Antonin. Cæsar.» In the lower Greek empire, a new dignity of Sebastocrator was conferred, and that of Cæsar became the third rank in the state. From Cæsar are derived the German «kaiser» and the Russian «tsar.»

CÆSAR, Gaius Julius, the greatest representative of the genius of Rome, a man of consummate ability alike as a general, a constructive statesman and a writer. He was born, according to all the ancient authorities, 12 July 100 B.C., but Mommsen, in his ‘History of Rome,’ considers that the year should be given as 102. Of purest patrician ancestry, and with a family tradition intimately associated with the rule of the senatorial oligarchy, he was yet, from early youth, a champion of the popular party. His aunt Julia had married Marius, and when, upon the latter's death in 86, Cinna became the leader of the Populares, Cæsar entered into intimate relations with him and in 83 married his daughter Cornelia. But the following year Sulla returned from the East and overwhelmed the foes of the Senate. A reign of terror for the Marian party followed. With characteristic boldness, Cæsar refused to divorce his wife at the order of the dictator, and lost, in consequence, his property, his position as priest of Jupiter and almost his life. The famous story that Sulla pardoned him with the remark that "he would one day be the ruin of the aristocracy, for in him there was many a Marius," though vouched for by both Suetonius and Plutarch, seems strikingly inconsistent with Sulla's usual remorseless logic. Partly to avoid further trouble, and partly to gain that military experience which was at Rome deemed a prerequisite to an official career, he now went to Asia, and, as a staff officer, served with distinguished bravery at the siege of Mytilene, and afterward against the pirates in Cilicia, but returned home upon receiving news of Sulla's death in 78. As pleading in the courts was the natural avenue to popular favor, we presently find him acting as prosecutor in two cases involving extortion in provincial administration. But the culprits, Dolabella and Antonius, belonged to the senatorial order, and his eloquence, though it won applause, failed to move juries composed of senators. He determined to perfect himself in oratory by studying under the most famous teacher of the age, Apollonius Molo of Rhodes. On the way thither he fell into the hands of pirates near Miletus, and was held for a ransom of 50 talents (over $55,000). During a stay of almost 40 days he won the admiration of his captors by his coolness and wit, and laughingly promised to crucify them all as soon as he should obtain his freedom, a threat which he promptly carried out to the letter. He studied under Molo only a short time, however, for the renewal of hostilities by Mithridates against the Roman province of Asia brought him into the field with some hastily levied troops, and, after brief but effective service, he returned to Rome in the winter of 74–73. He had been elected pontifex in his absence, and now took part, with the utmost energy, in the attempts that were being made to overthrow the Sullan constitution. This was accomplished in the year 70, though in a totally unexpected manner, by the legislation of Pompey and Crassus, both of whom had, previous to that time, been supporters of senatorial prerogative. Meanwhile Cæsar, by his unfailing courtesy and good will, and a lavish generosity that soon plunged him deep into debt, had been winning all hearts. In 69 he was elected quæstor, and was assigned to the province of Further Spain. But before his departure he lost his aunt Julia and his wife, Cornelia. At the former's funeral he caused busts of Marius to be carried in the procession, to the great delight of the populace, and in the two memorial addresses which he delivered in the forum he eulogized the aims and leaders of the people's party. In Spain he must have noted with appreciation the work of the great Marian general, Sertorius, the first man who tried to romanize the provincials. Upon his return, in 67, he entered into friendly relations with Pompey, and supported the Gabinian and Manilian laws, by which the latter was to receive the supreme command against the pirates and Mithridates, with powers unprecedented in the history of the republic. In 65 he was ædile, and met the demands of his office with unheard of magnificence in buildings and games. In particular, he stirred the people to frantic enthusiasm by secretly erecting in the capitol new trophies of Marius, to replace those which Sulla had destroyed. In 63 he was chosen pontifex maximus, an office of great prestige and prominence in a state in which religion and politics had always been closely associated. That he had knowledge of the Catilinarian conspiracy of this year is by no means unlikely. But he took no part in it, and the aristocracy was unable to persuade Cicero to include him in the list of the conspirators. In 62 he was prætor, and in the following year went as governor to Further Spain, where for the first time he commanded an army and became conscious of his military genius. Toward the end of 61 Pompey returned to Rome, a victor over the entire East, but was coldly received by the distrustful Senate, which refused to ratify his acts in Asia and to make the assignments of lands promised to his veterans. Cæsar, returning from Spain, seized his opportunity, and about the time of his election to the consulship, reconciled Pompey and Crassus, whose enormous wealth made him indispensable, and formed with them the so-called First Triumvirate. The alliance was strengthened by the marriage of Pompey with Cæsar's daughter Julia. During his consulship in 59 Cæsar carried, among other measures, a popular agrarian bill, the ratification of Pompey's acts, and a stringent law against extortion in the provinces, while he won to his support the whole equestrian order, to which the collectors of the public revenues belonged, by modifying the terms of their last contract with the state. His popularity enabled him to secure the assignment to himself for five years (subsequently increased to 10) of the provinces of Cisalpine Gaul, Illyricum and Transalpine Gaul, together with four legions. The following eight years (58–51) witnessed those brilliant campaigns which ended in the complete subjugation of Gaul, and its acceptance of the laws, language and civilization of Rome. The first three years of war brought all Gaul to his feet, but the love of liberty was still too strong in this brave people, and dangerous revolts broke out year after year. In 55 he crossed the Rhine on the famous bridge, and later made his first expedition to Britain, which he invaded again the following year. Finally, in the winter of 53–52, Vercingetorix, Gaul's greatest hero, and a born leader of men, organized a general uprising of all the tribes. The flame of insurrection swept over the whole country. The campaign culminated in the siege of Alesia (Alise in Burgundy), an almost impregnable fortress into which the Gallic chieftain had thrown himself with 80,000 men. Cæsar invested the place with less than 60,000, and was presently himself invested by an enormous army of relief, estimated at over 240,000 men. But he completely routed this vast host, and Vercingetorix, worn out by hunger, surrendered. By the end of the following year Cæsar was at last able to address himself to the peaceful organization of the new territory.

At Rome, however, a crisis was imminent. The ties between Cæsar and Pompey were being rapidly dissolved. The death, in 54, of Julia, Pompey's wife and Cæsar's daughter, was followed in 53 by the defeat and death of Crassus in the Parthian War. Pompey became more and more jealous of his rival's military glory, and the Senate, resolved to crush Cæsar at any cost, and itself unable even to keep order in the streets of Rome, made friendly overtures to Pompey, and in 52 made him sole consul, with practically the powers of a dictator. Cæsar's term of office would expire on 1 March 49. It was essential to his safety that he should retain his provinces and his army until after he should be elected consul for 48. But the aristocracy was plainly determined that there should be an interval during which he would be a mere private citizen, defenseless against the attacks of his enemies. It is certain that Cæsar acted with great moderation, even sending to Italy two of his legions which the Senate declared were needed for the war in the East, but which, as he had foreseen, were instead placed in camp at Capua. At length, in January 49, the decisive step was taken. The Senate ordered Cæsar to lay down his command on pain of being proclaimed a public enemy. The tribunes of the people, Antony and Quintus Cassius, who had in vain interposed their veto, fled to him for protection in their inviolable office; Cæsar with a single legion crossed the Rubicon, the frontier stream of Italy, and war was begun.

In the ensuing five years, all that remained for him of life, the amazing energy and resourcefulness of this extraordinary man are most impressively displayed. In three months, without striking a blow, he was master of Italy, and Pompey, with a small force, barely escaped from Brundisium across the Adriatic. Cæsar had no ships on which to follow him, and besides, the veteran Pompeian forces in Spain must be crushed before they could join their commander. Accordingly after first securing Sicily and Sardinia, through his lieutenants, he crossed the Pyrenees into Spain, and, in a brief campaign of 40 days, perhaps the most brilliant in all his career, extricated himself from apparently certain destruction, and forced the surrender of the entire opposing army. All Spain now declared for him. On his way back he received the submission of Massilia (Marseilles), which had been besieged by Decimus Brutus and Trebonius. Eleven days were spent in Rome in administrative work, and early in January 48 he crossed the Adriatic and proceeded to surround Pompey, near Dyrrachium, now Durazzo. But his force was quite insufficient, and, to deprive his foe of the advantage of the sea, he retreated into Thessaly, whither Pompey followed him, and the decisive battle was fought on the plain of Pharsalus, 9 Aug. 48. Pompey had 47,000 infantry and 7,000 cavalry; Cæsar only 22,000 infantry and 1,000 cavalry. But the latter's army was composed of veterans, and numbers did not avail. Pompey fled to Egypt where he was brutally murdered. Cæsar, who had followed him with all speed, was nearly trapped in Alexandria by the forces of the young King Ptolemy, but ultimately, upon the arrival of reinforcements, defeated them, and set Cleopatra upon the throne. He then passed through Syria and Asia Minor, putting affairs on a permanent basis, and incidentally defeating Pharnaces, a son of the great Mithridates. The victory was announced in the famous despatch, "*Veni, vidi, vici*" ("I came, I saw, I conquered"). Upon his return he announced his intention of pardoning all who had fought against him. In December he left Rome for Africa, where the campaign against the Pompeians, commanded by Scipio and Cato, ended in a sweeping victory at Thapsus, 6 April 46. Cato, unable to defend Utica, committed suicide. Cæsar returned to Rome in June, and, after celebrating his victories over the Gauls, Egyptians, Pharnaces and Juba, King of Numidia, who had fought against him at Thapsus, by four magnificent triumphs, flung himself into the work of legislation. Among his reforms was the placing of the calendar, for the first time, upon a scientific basis. But these labors were interrupted by a dangerous revolt in Spain, headed by Pompey's sons, and the campaign against them, ending in the hard-fought battle of Munda, 17 March, and the final settlement of affairs in Spain, necessitated his absence from Rome from the end of 46 to September 45. The Senate welcomed him upon his return with the most servile flattery. He was already tribune for life; he was now made, for life, dictator and *præfectus morum,* a new term for the censorship; his head was stamped on the coinage, the month of Quintilis was renamed Julius and he was given divine honors. With absolute power thus lodged in his hands, he set about the permanent reconstruction of the government and the social fabric. He made the Senate a much larger and more representative body, increased the number of magistrates, reduced by one-half the recipients of the donation of grain, passed several laws in the interest of the debtor class and of Italian agriculture, prohibited farming by slave labor exclusively, inaugurated a far-reaching plan to colonize in the provinces the unemployed population of Rome and Italy, and laid a legal foundation for the principle of limited local self-government of all Roman communities, wherever they might be. He had in mind, but did not live to carry out, the codification of the laws, the building of public libraries, the draining of the Pontine marshes, the making of a canal through the Isthmus of Corinth, and the taking of a general census which should form a just basis for the imposition of taxes throughout the empire.

But he had risen too high to escape hatred. The plot to assassinate him probably originated in the personal spite of Gaius Cassius, but many of the conspirators, in particular Marcus Brutus, were foolish enough to believe that by the death of the dictator the republic could be restored. On 15 March 44 B.C., at a meeting of the Senate held in the hall attached to Pompey's theatre, he fell at the feet of his great rival's statue, pierced by 23 wounds.

In studying Cæsar's life, one is especially struck by three points: his sane perception of the concrete fact, his indomitable energy and his many-sidedness. More clearly than any other man of that time, he saw that the senatorial oligarchy had been proved wholly incompetent to govern a great empire, and that the problem could be solved only by the concentration of all power in the hands of a single man. Augustus cautiously veiled the change to monarchy; Julius bluntly called things by their real names and paid the penalty with his life. He was an able orator, but of his speeches, warmly praised by Cicero and Quintilian, none has come down to us. A treatise on grammar and one on astronomy have also perished. But his enduring fame as a writer rests upon the seven books of 'Commentaries on the Gallic War' (the eighth book is by Aulus Hirtius) and the three books of 'Commentaries on the Civil War.' The former, essentially a political document, published in 51 B.C., is unsurpassed in its succinct simplicity and strength. See COMMENTARIES ON THE GALLIC WAR.

Bibliography.— The principal ancient authorities are the biographies of Plutarch and Suetonius, Cicero's 'Letters,' Sallust's 'Catiline,' Lucan's 'Pharsalia,' Cæsar's own 'Commentaries,' and the Roman histories of Velleius Paterculus, Appian and Dion Cassius. Mommsen's account in his 'History of Rome' is brilliant but over-enthusiastic. The following books may be recommended: Fowler, 'Julius Cæsar and the Foundation of the Roman Imperial System' (New York 1899); Dodge, 'Cæsar' (Boston 1892); Drumann, 'Geschichte Roms' (Vol. III, ed. by Gröbe 1906); Froude, 'Cæsar' (New York 1884); Napoleon III, 'Histoire de Jules César' (Eng. trans., New York 1865); continued by Stoffel, 'Histoire de Jules César; la guerre civile' (Paris 1887); Holmes, 'Cæsar's Conquest of Gaul' (London 1899); Holmes, 'Ancient Britain and the Invasions of Julius Cæsar' (Oxford 1907); Ferrero, 'Greatness and Decline of Rome' (Vol. II Eng. trans., New York 1907); Tyrell's edition of the 'Correspondence of Cicero' (Introduction to Vol. V); Scott, 'Portraitures of Julius Cæsar' (London 1903); Roper, 'The Likenesses of Julius Cæsar' (in *Scribner's Magazine,* 1887); Veith, 'Geschichte der Feldzüge C. Julius Caesars' (1906); Holmes-Schott-Rosenberg, 'Cäsars Feldzüge in Gallien und Brittanien,' a condensation of the two works by Holmes, mentioned above. NELSON G. MCCREA.
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CÆSAREA, sēs-a-rēạ, the ancient name of many cities: (1) CÆSAREA PHILIPPI, or PANEAS (deriving its second name from the local deity, Pan, to whom the neighboring grotto, the source of the river Jordan, was dedicated), named after Philip, tetrarch of Galilee, son of Herod the Great, who founded it in 3–2 B.C., near the source of the Jordan on the southern slope of Mount Hermon. It is mentioned twice in the Gospels. On its site is the small modern village of Banias. It fell into the hands of the Crusaders in 1130 but was recaptured by the Moslems (1165). (2) CÆSAREA PALESTINÆ or STRATONIS, on the shores of the Mediterranean, about 55 miles northwest from Jerusalem. It was built with great magnificence by Herod the Great, named in honor of Augustus Cæsar, and became the metropolis of Palestine, and the seat of the Roman proconsul, as well as a busy seaport owing to the fact that Herod, who encouraged commerce, built there one of the finest ports on the coast, and protected it by a breakwater, the ruins of which still exist there. It was the place where Herod Agrippa was smitten by the angel (Acts xii, 20–23), where Cornelius the centurion resided (x), and Saint Paul was imprisoned two years (xxiii–xxv). It was a place of some importance during the Crusades, but is now a scene of ruin and of utter desolation. Eusebius was bishop of Cæsarea. (3) The ancient capital of Cappadocia in Asia Minor, originally called Mazaca, and now Kaisarieh. It is situated in the southeast of the vilayet of Angora, at the foot of the Erjish Dagh, about 160 miles to the southeast of the town of Angora. It was once supposed to contain 400,000 inhabitants. It has now about 70,000 inhabitants, and its position makes it a place of considerable trade. The manufacture of carpets, though of quite recent introduction, is of some importance. Foreign goods are received by way of the railway from Angora to Constantinople. The name Cæsarea dates from the time of Tiberius, and under Valerian the city was captured by Sapor, when a large number of its inhabitants were slain.

CÆSAREAN SECTION, a surgical operation in obstetrics which consists in delivering a child by means of an incision through the abdominal walls and the uterus. The operation has been recorded since ancient times but was performed at first upon a dead or dying woman and was required by Roman and later by Venetian law. The first recorded instance of operation upon a living woman was in 1500 when a butcher of Switzerland operated upon his wife. After this it was frequently resorted to but with a very high mortality for the mother until the latter half of the 19th century brought the knowledge of antiseptic and aseptic surgery and suturing for control of hæmorrhage. The mortality has now been decreased from almost 100 per cent to about 5 per cent, and its employment increases in favor. It is indicated when the child is alive and the mother dead, either in labor or in the later months of pregnancy, in extreme degrees of pelvic contraction, if the existence of malformation or tumor of the uterus, cervix or vagina render normal birth impossible, and in case of material complications such as eclampsia and concealed accidental hæmorrhage. The etymology of the name is probably from the Latin verb *cædere,* to cut, though it has been attributed to Julius Cæsar who is reported to have been born in this manner.

CÆSARION, the son of Julius Cæsar and Cleopatra, put to death by order of Augustus.

CÆSARIUS, Saint of Arles, French prelate of the 6th century, consecrated bishop of Arles in 502. Before the general adoption of monastic orders of the Rule of Saint Benedict his *Regulæ duæ* formed a standard of discipline much esteemed by the founders of orders. Consult Arnold, 'Cæsarius von Arelate und die gallische Kirche seiner Zeit' (Leipzig 1894).

CÆSARIUS OF NAZIANZUS, Christian scholar of the 4th century. From Alexandria, where his education was received, he went to Constantinople and rose to distinction as a mathematician and physicist. In the Latin editions of Saint Gregory are four dialogues ascribed to him, as also in the 'Bibliotheca

Patrum,’ and he is also credited with a work styled ‘Contra Gentes.’

CÆSARS, The Era of, also known as the Spanish Era, a period of time reckoned from 1 Jan. 38 B.C., being the year following the conquest of Spain by Augustus. It was much used in Africa, Spain and the south of France; but by a synod held in 1180 its use was abolished in all the churches dependent on Barcelona. Pedro IV of Aragon abolished the use of it in his dominions in 1350. John of Castile did the same in 1383. It was used in Portugal till 1415, if not till 1422. The months and days of this era are identical with the Julian calendar, and to turn the time into that of our era, subtract 38 from the year; but if before the Christian era, subtract 39.

CÆSAR’S COMMENTARIES. This great work contains the narrative of Cæsar’s military operations in Gaul, Germany and Britain. It was given to the world in the year 51 B.C. Every victory won by Cæsar had only served to increase the alarm and hostility of his enemies at Rome, and doubt and suspicion were beginning to spread among the plebeians, on whom he chiefly relied for help in carrying out his designs. When public opinion was evidently taking the side of the Gauls and Germans the time had come for Cæsar to act on public opinion. Hence the ‘Commentaries,’ a hasty compilation made from notes jotted down in his tent or during a journey. As to its truthfulness we cannot decide absolutely, the Gauls not having written *their* commentaries. But if Cæsar sinned in this respect, it was probably by omission, not by commission. Things the Romans might not like he does not mention: the sole aim of the book is to gain their suffrages. There is no allusion to the enormous fortune Cæsar acquired by plunder. On the other hand, he speaks of his cruelties — for instance, the killing in cold blood of 20,000 or 100,000 prisoners — with a calmness that to us is horrible, but which the Romans would deem natural and proper. The ‘editio princeps’ or first edition was printed at Rome (1449).

CÆSIUM, sē′zĭ-ŭm, a metallic element discovered in 1860 by Bunsen and Kirchhoff, in the form of the chloride, in a mineral spring at Dürkheim, Bavaria. It has the historic distinction of being the first element discovered by the agency of the spectroscope. The metal is widely disseminated, but is seldom found in any considerable quantity. It never occurs in the metallic state, but usually as the chloride or oxide, and commonly associated with the rare element rubidium. Cæsium is found in the ashes of many seaweeds, in tea and tobacco and in several mineral springs. It is also a common constituent of the drainage water of mines. Its most important source is the mineral pollucite (q.v.), or pollux, which is found on the island of Elba and in the vicinity of Hebron, Me., and which contains as much as 36 per cent of cæsium oxide, with no rubidium. Cæsium forms stable salts, and strongly resembles potassium in its chemical properties. It may be separated from this metal by taking advantage of the fact that cæsium platinochloride is much less soluble in water than the corresponding potassium compound. Metallic cæsium cannot be obtained by reducing the oxide with carbon, but is best prepared by the electrolysis of a fused mixture of four parts of the cyanide of cæsium and one part of the cyanide of barium, using aluminum electrodes. It may also be obtained by heating cæsium chloride with metallic calcium. It is a silvery white metal, quite soft and ductile, and oxidizing rapidly upon exposure to the air. It also decomposes water with the production of sufficient heat to ignite the liberated hydrogen. Cæsium has a specific gravity of 1.88, and melts at about 80° F. Its chemical symbol is Cs, and its atomic weight is 133 ($O = 16$). Its oxalate and nitrate are used to a limited extent in medicine. The spectrum of cæsium is characterized by two blue lines, from which circumstance the element takes its name (*cæsius*, bluish-gray). Cæsium stands first in rank among the electro-positive elements.

CÆSTUS. See CESTUS.

CÆSURA, sę-zū′rą, in verse, the resting of the voice on a syllable; in Latin verse, the cæsura divides the line or verse into two parts and renders the syllable on which it falls long.

CAF, käf, or **KAF,** a fabled mountain of the Mohammedans which encircles the whole earth. It is the home of giants and fairies, and rests upon the sacred stone Sakhral, one grain of which gives miraculous powers to its possessor. This stone is of an emerald color, and its reflected light is the cause of the tints of the sky. The name «Kaf» is sometimes applied to the Caucasus range.

CAFÉ, kä-fā, a coffee-house, enlarged by American usage to include restaurants of all descriptions.

CAFFARELLI, käf-fą-rĕl′lē, **François Marie Auguste,** French general, brother of the famous bishop of the same name: b. Falga, Haute-Garonne, 7 Oct. 1766; d. 23 Jan. 1849. At the beginning of the Revolution he was employed in the Sardinian army, but joined the army of the republic as a simple dragoon. He was in command of the French army that opposed the Spanish invasion of the Pyrenees in 1793. For his good work in this campaign he was made adjutant-general and later on chief of the consular guard. In 1804 he was charged with the mission to Rome to induce the Pope to come to Paris to perform the ceremony of Napoleon’s coronation, and on his return was made governor of the Tuileries. He was wounded at Austerlitz, where he distinguished himself for his bravery and ability as a leader; accompanied Prince Eugene in Italy, where he became Minister of War and Marine; took part in the war in Spain, and defended Metz against the Russians. In 1814 he was chosen by Napoleon to conduct the Empress and son from Paris to Vienna. He retired from public life after the battle of Waterloo.

CAFFEINE, kăf′fē-ĭn, an alkaloid occurring in the coffee bean, and having the formula $C_8H_{10}N_4O_2$. It is considered identical with the alkaloid theine, which occurs in tea, and also with guaranine (the alkaloid of guarana); and it is present in small amounts in cocoa. It is found also in maté or Paraguay tea, and also in Kola nuts. Coffee contains by weight about 1.5 per cent of caffeine; and tea, from 3 to 4 per cent. It may be prepared by adding basic acetate of lead to a strong decoction of coffee or tea until the tannin that is present has all been precipitated, removing excess of lead by a stream of sulphuretted hydrogen, and then evaporating the filtrate until the caffeine crystallizes out. For commercial purposes it is commonly prepared from tea dust. This is heated for an hour with four times its weight of boiling water, and then mixed with its weight in lime, and dried. The caffeine is dissolved out with boiling chloroform. When prepared from a water solution caffeine consists of a mass of silky needles which contain more or less water; when by a chloroform solution it is anhydrous. It is but slightly soluble in water, alcohol or ether. It has a bitter taste, and although it acts as a weak base, its salts are decomposed by water. See also COFFEE.

CAFFI, kăf'fē, **Ippolito**, Italian artist: b. Bulluno 1814; d. near Lissa, 20 July 1866. He studied in Venice and excelled in matters in perspective and effects of light. He also lived in Rome and traveled extensively in Africa and the East. Among his chief works are ‹Isthmus of Suez›; and ‹Carnival Scene on the Piazetta, Venice› (1855). He was killed on the Italian battleship *Re d'Italia* in a naval battle off Lissa, being present on that occasion with the design of painting a picture of the engagement. He also painted the ‹Panorama of Rome.› Many of his works are in the Museo-Civico, Venice. Consult his biography by Codem-Gerstenbrand (Venice 1868).

CAFFIN, Charles Henry, American art critic: b. Sittingbourne, Kent, England, 4 June 1854. He was educated at Oxford and, after engaging in school and theatrical work, came to the United States in 1892 and worked in the decoration department of the Chicago Exposition. He went to New York in 1897 and became art critic for *Harper's Weekly*, New York *Evening Post* and New York *Sun* (1901–04). His published works which are popular in style include ‹Photography as a Fine Art› (1901); ‹American Masters of Painting› (1902); ‹American Masters of Sculpture› (1903); ‹How to Study Pictures› (1905); ‹Story of American Painting› (1907); ‹Story of Spanish Painting› (1910); ‹Story of French Painting› (1911); ‹Art for Life's Sake› (1913); ‹How to Study Architecture› (1915).

CAGAYAN, kä-gą-yän', an island of the Philippine group; the largest of six small islets, known as the Cagayan-Sulu group. It is five miles wide and eight miles long. Pop. about 3,500. There are mountains attaining a height of 1,100 feet. The chief products are tobacco and sugar. There are pearl and shell fisheries. Cagayan was sold by Spain to the United States, with Cibitu, in 1900, upon payment of $100,000, having been inadvertently excluded from the terms of the treaty of peace.

CAGE-BIRDS, birds kept in cages for the benefit or enjoyment afforded by their powers of song, beauty of plumage, ability to talk or companionship. They have been so kept by human beings ever since prehistoric times. The first essential for the maintenance of birds in captivity is a cage as large as possible, and as nearly like the birds, original habitat as circumstances permit. Cleanliness is a prime necessity, and the bird should be given a constant fresh supply of water for bathing and drinking purposes, and as much fresh air and light as possible, always, however, avoiding draughts and the sun's direct rays. The food and necessary attention bestowed on the bird vary according to the species.

Birds are captured by means of birdlime or a falling net, but many are taken from their nests when young, and so tamed, or are bred solely for market purposes. An important trade throughout Europe is the rearing of cage-birds, especially German canaries. The best-known songster, and probably the most popular cage-bird, is the common canary (q.v.), originally a native of the Canary Islands. It is typical of captive birds generally, in the marked change produced by captivity and selective breeding, in coloring and size, from its original wild state. Other widely known and popular cage-birds are the nightingale, goldfinch, cardinal, mocking-bird, bullfinch, the Indian bulbul, several European thrushes, and others, all of which are fine singers. Among the birds kept because of their beauty are the parrakeets, love-birds, cockatoos, macaws, the whydah-bird, the painted finches and others. Those imitating human speech are not so plentiful, consisting chiefly of the parrot, of which there are several species, and the starlings, especially the English species, and the Indian mina-bird (qq.v.). Owing to the change of climate, and especially the cold, nine-tenths of the African parrots transported to Europe or North America die before learning to speak. It is advisable, therefore, to purchase such birds in the spring, thus giving them a chance to become gradually acclimated.

In the case of all cage-birds most particular attention should be paid to their food, and overfeeding must be especially guarded against. Frequently ailments can be greatly benefited by a fresh supply of food given in smaller quantities. Insectivorous birds are most troublesome to care for in regard to food, as their diet is less easily obtained. In case of inability to procure the accustomed food, finely chopped meat should be substituted, and a reasonable quantity of spiders is always beneficial. The universal and most acceptable food to nearly all birds, however, is canary-seed, with which hemp, rape or oats may frequently be mixed to advantage. Seed-eating birds should be given such fresh vegetable matter as soft green leaves, chickweed or lettuce, at regular intervals. Sugar in small quantities is also beneficial, but acid fruits of all kinds should be avoided. A prime necessity in the rearing of cage-birds is something on which the bird may sharpen its bill. This is most easily supplied in the form of sandpaper, or, better, cuttle-fish bone, which is essential to the health of breeding birds. A bird's nails are apt to grow so long as to become troublesome to it, but in clipping them care should be taken to use a sharp pair of scissors, avoiding a possible injury to the foot by twisting. In case of illness due to overfeeding, a drop of castor oil may prove beneficial, especially if it is accompanied by a change of surroundings, quiet and a simpler diet for a time.

Bibliography.— Bechstein, ‹Cage and Chamber Birds› (London 1864), a most complete work; and Greene, ‹Notes on Cage Birds› (London 1899); Dixon, ‹Dovecote and Aviary› (London 1851); Holden, ‹Book on Birds› (Boston 1875); Greene, ‹Diseases of Cage Birds› (London 1897); Blackston, Swaysland

and Wiener, 'Book of Canaries and Cage Birds' (London); Greene, 'Parrots in Captivity' (London 1884); Butler, 'Foreign Finches in Captivity' (London 1899); and 'How to Sex Cage Birds' (London 1907); Oldeys, 'Cage-bird Traffic of the United States' (Washington 1907); Norman, 'Aviaries, Bird-rooms and Cages' (London 1908); Birchley, 'British Birds for Cages, Aviaries, and Exhibitions' (London 1909); Telling, 'Practical Guide to Successful Cage-bird Culture' (London 1909). *The Avicultural Magazine* and *Bird Notes* are two monthly magazines published in London and devoted to the interest of cage and aviary birds.

CAGLI, kä'lyē, Italy, city and bishop's see of the province of Pesaro e Urbino at the confluence of the Cantiano and Busso, 18 miles by rail south of Urbino. It has a fine cathedral; the church of San Domenico is noted for its frescoes by Giovanni Sanzio, father of Raphael; and there are interesting archæological remains dating from early Roman days. Pop. 13,000.

CAGLIARI, käl-yä'rē, **Paolo**. See VERONESE, PAOLO.

CAGLIARI, Sardinia, the capital of the island, situated on a hill slope near the south coast. It consists of four parts: (1) the Castle or old town; (2) the Marina; (3) Estempache; (4) the Villa Nuova or new town. It is fortified, and is the residence of the viceroy and of an archbishop, and the seat of a university founded in 1596, and revived and remodeled in 1765. Cagliari has some manufactures, and is the chief emporium of the Sardinian trade. There are dockyards and a spacious and safe harbor. The "Castle" contains some important buildings, including palaces of the nobility. The cathedral, partly faced with marble, was completed in 1312, but afterward modernized. The city was founded by the Phœnicians, and there are some interesting remains of Roman times, including an amphitheatre and ancient dwelling-houses. Cagliari was the residence of the kings of Sardinia from 1798 to 1814. It is connected by railway with the most important Sardinian towns. Pop. of commune 59,606.

CAGLIOSTRO, käl-yōs'trō, **Alessandro** (COUNT OF) (real name *Giuseppe Balsamo*), Italian charlatan: b. Palermo, 8 June 1743; d. Saint Leon, Italy, 26 Aug. 1795. He entered the order of the Brothers of Mercy, where he found an opportunity to cultivate his talents for medical science, by which he afterward distinguished himself. But as he showed at the same time a great love of dissipation, he was compelled to separate from the order. He returned to Palermo, where, among other tricks, he deceived some credulous persons by his pretended skill in magic and the finding of hidden treasures. He also showed himself adroit in counterfeiting handwriting, and attempted to get possession of a contested estate by means of a forged document, but was discovered and was obliged to flee. He now determined to go to Rome, and in his journey through Calabria became acquainted with Lorenza Feliciani, daughter of a belt-maker, who appeared to him intended by fortune to assist his designs. He formed an intimacy with her, and they began their travels, in which he assumed the character of a man of rank, first appearing under the name of the Marquis Pellegrini, and finally under that of the Count Cagliostro. He traveled through many countries of Europe, stopped in the capital cities, and by his chemical mixtures, his tricks, and by the amours of his companion, gained considerable sums. He knew how to cheat with great ingenuity, and was always fortunate enough to preserve himself by an early flight, if men's eyes began to be opened, or waking justice threatened him with imprisonment. The discovery of the philosopher's stone, the preparation of a precious elixir vitæ, etc., were the pretenses by means of which he extracted considerable sums from credulous people. Many had recourse to his assistance, not indeed to be initiated into the mysteries of magic, but to purchase at a high rate different kinds of medicine, one of which was the water of beauty. This profitable business employed him many years; but his trade in medicine began to grow less lucrative, and he determined to seek his fortune as the founder of a new and secret sect. In pursuance of this plan he passed himself off during his second residence in London for a Free Mason, and played the part of a magician and worker of miracles, in which character he drew upon himself the eyes of all the enthusiasts in Europe. The Countess Cagliostro, on her part, did not remain idle. She was the first and most perfect scholar of her husband, and ably played the part of a priestess to this new order. His plan for reviving an old Egyptian order, the founders of which he declared to be Enoch and Elias, contained a mass of absurdities, but his pretensions to supernatural power, the mystery with which his doctrines were enveloped, his pretended ability to work miracles, his healing the sick without pay, with the greatest appearance of generosity, and the belief that, as the Great Kophta (this name he had taken as the restorer of Egyptian masonry), he could reveal the secrets of futurity, gained him many friends and supporters. Cagliostro again traveled through Europe, and attracted great attention in Mittau, Strassburg, Lyons and Paris. While in this last city (1785) he had the misfortune to be implicated in the scandalous affair of the Diamond Necklace, and was banished the country as a confidant of Cardinal Rohan. He now returned to London, and sent many epistles to his followers, wherein he bitterly complained of the injury he had received in France, and painted the French court in the blackest colors. From London, where he could not long remain, he went to Basel and other cities in that quarter. But at length, listening to the repeated entreaties of his wife and other friends, he returned (1789) to Rome. Here he busied himself about Freemasonry; but being discovered and committed to the Castle of Saint Angelo, he was condemned by a decree of the Roman Inquisition to imprisonment for life as a Freemason, an arch heretic and a very dangerous foe to religion. He died after five years' imprisonment. His wife retired to a convent. Consult the Cagliostro bibliography by W. E. A. Axon in 'Notes and Queries' (4th series, Vol. X, London 1872); Carlyle, Thomas, 'The Life of Count Cagliostro' (London 1787); 'The Life of Joseph Balsamo, Commonly Called Count Cagliostro' (London 1791); Trowbridge, 'Cagliostro; the Splendor and Misery of a Master of Magic' (New York 1910). There is much spurious material in existence concerning Cagliostro, such as the so-called 'Mémoires authentiques' (Paris 1786).

CAGNACCI, kän-yä'chē. See CANLASSI.

CAGNOLA, kän-yō'lą, **Luigi,** MARCHESE, an Italian architect: b. Milan, 9 June 1762; d. Inveriga, 14 Aug. 1833. He was a member of the State Council, and was much engaged in political affairs. His most celebrated works are the Arco della Pace, "Arch of Peace," commenced in 1807 and finished in 1837; the Porta di Marengo, subsequently called Porta di Ticino (both built by order of Napoleon), at Milan; the Campanile, at Urgnano, completed in 1829, and the mausoleum for the Metternich family.

CAGNOLI, kän-yō'lē, **Antonio,** Italian astronomer: b. Zante, Ionian Islands, 1743; d. Verona, Italy, 1816. He was attached in his youth to the Venetian embassy at Paris, where, after the year 1776, he showed more love for astronomy than for diplomacy. Having settled in Verona in 1786 he constructed an observatory in his own house, by his observations in which he enriched the science of astronomy with many discoveries. After the destruction of his observatory by the French (1798), who, however, compensated him for his loss, his instruments were transferred to the observatory of Brera in Milan, and he was appointed professor of astronomy in the military school at Modena. His best works are 'Notizie Astronomiche adat. all' uso comune' (1802); 'Trigonometria Piana e Sferica' (2d ed., Bologna 1804).

CAGOTS, kạ-gō', a race or caste of men, living in the south of France in the region of the Pyrenees, regarded as pariahs or social outcasts. In former ages they were shut out from society as lepers, cursed as heretics and abhorred as cannibals; their feet were bored with an iron, and they were forced to wear a piece of red cloth in the shape of a duck's foot on their clothes by way of distinction. The only trade they were allowed to follow was that of sawyers or carpenters. They had to enter the church by a special door, and had a special corner set apart for them with a holy-water vessel for themselves. Opinions are divided with regard to the origin of the Cagots, of whom there are now comparatively few. They have been considered by some to be remains of the Saracens conquered by Charles Martel. The most plausible conjecture is that which derives them from the Visigoths who established themselves in the south of France and in Spain in the 5th century. The origin of the name has been the subject of equal controversy. Among numerous derivations, is that from *canis* and *gothus,* "dogs of Goths." Others derive the name from a word simply meaning leper, and believe that the Cagots were originally lepers, who as such were expelled from the society of and intercourse with their fellowmen. Several diseases and deformities, doubtless due to inbreeding, are common among them, such as cretinism (q.v.), goitre, etc. Until the French Revolution the Cagots were not considered citizens. Some remains of them, or of corresponding outcasts, are to be found under various names in different parts of France. Their language is a jargon of neighborhood dialects with some original forms. Similar remains are also found among the mountains of North Spain. Consult Michel, 'Histoire des races maudites de la France et de l'Espagne.'

CAGSAUA, kag'sä-wä', or **DARAGA,** Philippines, town of Luzon, Albay province, two miles north of Albay, an important hemp growing and trading centre. Pop. 18,700.

CAGUAS, kä'gwäs, Porto Rico, municipality and commune; on the military road, 22 miles southeast of San Juan. It is a thriving tobacco growing and cigar manufacturing centre, and also has marble and limestone quarrying industries. Pop. 10,500.

CAHAN, kä'han, **Abraham,** Russo-American journalist and novelist: b. Vilna, Russia, 7 July 1860. He came to the United States in 1882 and has edited several Yiddish periodicals in New York. He was prominent as a labor leader and in time drifted to the Socialists. He became editor of the Jewish daily *Vorwärts* in 1901. After 1884 he was a constant contributor to American journals, his articles generally dealing with phases of Ghetto life. He has written 'Yekl, a Tale of the New York Ghetto'; 'Raphael Narizokh,' in Yiddish; 'The Chasm'; 'The Imported Bridegroom and Other Stories'; 'The White Terror and the Red' (1904); 'Ein Historie von die Vereinigte Staaten' (1912); 'Yiddish Folk Songs' (1912).

CAHENSLYISM, a popular name given to a movement in the United States in 1891, among Roman Catholics speaking other languages than English, to have bishops or priests of their respective nationalities appointed over them. It took its name from Herr Cahensly, a layman, secretary of Saint Raphael's Society for the protection of German Catholic immigrants to this country, on the supposition that he was the chief inspirer of the movement. On a visit to the United States in 1893 Herr Cahensly denied his connection with the scheme. It was vigorously opposed by most of the English-speaking prelates of the Roman Catholic Church in this country. It received no official sanction by the Vatican authorities, and, after considerable agitation in the Catholic and secular press, died out. As a matter of fact, owing to the large immigration of Roman Catholics speaking foreign tongues, priests of their respective nationalities are often appointed to administer to their spiritual needs. This is especially notable in the instance of the Italians. To meet this necessity in the archdiocese of New York, the study of Italian is now made compulsory in its diocesan seminary for all candidates for the priesthood.

CAHILL, Thaddeus, American inventor: b. Iowa 1867. After studies at Oberlin College 1884–85, and a law course at George Washington (then Columbian) University, he was admitted to the bar in 1894, but never practised, devoting himself to mechanical invention. His most notable achievements are the electric typewriter and the telharmonium, the latter a device to produce music electrically by means of dynamos transmitting vibrations from a central station to receiving telephones. George Washington University conferred on him the degree of D.C.L. in 1900.

CAHORS, kạ-ōr', France (ancient Cadurcum), capital of the department of Lot, and on the river of that name, 60 miles north of Toulouse. It is nearly surrounded by the river, and communicates with the opposite shore by three bridges, one of which, dating from the 14th century, is the finest fortified bridge of mediæval times existing in the country. Before the conquest of Gaul by Cæsar it was the capital of the Cadurci, and under the Romans, who gave it the name of Divona, it was adorned with a temple, theatre, baths, an immense aqueduct and forum. Several Roman roads can still be traced in its vicinity. Among the principal edifices are the cathedral, an irregular structure, supposed to date from the 12th century; an episcopal palace, now converted into the prefecture; three old churches; barracks; a theatre; and a lyceum or college. In the Middle Ages it was a great centre of finance operated by Lombard bankers. Cahors had formerly a university, which was united with that of Toulouse in 1751. It was founded in 1322 by Pope John XXII, a native of the town. The celebrated jurist Cujas was a professor, and Fénelon a student, in it. The manufactures are insignificant; but a considerable trade is carried on in the red wine of the district, in brandy and nut oil. Coal is worked in the vicinity. Clément Marot, the poet, and Léon Gambetta, the statesman, were born here. Cahors was given up to the English by the Treaty of Brétigny in 1360. It revolted, and returned to French allegiance in 1428. Pop. (1911) 13,650.

CAIAPHAS, ka'yạ-fạs, the high-priest of the Jews at the time when the crucifixion took place. Previously, when the resurrection of Lazarus had spread dismay among the Jewish functionaries, it was Caiaphas who suggested the expediency of putting the Saviour to death, and when Jesus was arrested in Gethsemane he was carried first to Annas and then to Caiaphas, from whom he was transferred to the hands of the civil authority. Caiaphas was deposed, 35 A.D., and Jonathan, son of Annas, appointed in his stead. Consult Schürer, 'Geschichte des jüdischen Volkes' (Vol. II, 4th ed., 1907); Schmidt, 'The Prophet of Nazareth' (pp. 286f, 2d ed., 1907).

CAIBARIEN, kī-bä-rẹ-ān', Cuba, a town of the province of Santa Clara, situated on the northern seacoast; it has sponge fisheries and some trade. Pop. about 10,000.

CAICOS, kī'kōs, **CAYOS** or **THE KEYS** (from the Spanish *cayo*, a rock, shoal or islet), one of the island groups comprehended under the general name of the Bahamas, belonging to Great Britain, consisting of six islands besides some uninhabited rocks; between lat. 21° and 22° N. and long. 71° and 73° W. The largest, called the Great Key, is about 30 miles long. They are wooded and tolerably fertile, and at one time produced cotton, but at present the inhabitants are few in number and mostly engaged in fishing and the preparation of salt. In 1873 the Turks Islands and the Caicos were united into a commissionership under the governor of Jamaica. Pop. (1911) 5,615.

CAILLAUX, kä'yō', **Joseph**, French statesman: b. Mans 1863. After the study of law he entered politics and became inspector of finances in 1888. Elected deputy for Sarthe in 1898, 1902 and 1906, his rise was rapid. He was thrice Minister of Finance between 1899 and 1911, when he became Premier and Minister of the Interior. For the fourth time, 8 Dec. 1913, Caillaux was appointed Minister of Finance. His general administration, previously attacked and criticized, now became the object of a special campaign to discredit him, directed by Gaston Calmette, editor of the *Figaro*. Following the publication of a letter 13 March 1914 said to have been abstracted from M. Caillaux's office, and which showed duplicity on his part in connection with the defeat of the income tax bill, Mme. Caillaux shot and killed Calmette in his office 16 March 1914. This deed was followed by Caillaux's resignation. In December 1917 Caillaux and others were charged with treasonable correspondence with Germany in the course of the war. On 22 Dec 1917 the Chambre voted to deny Caillaux parliamentary immunity, he was arrested and held for trial. He was summoned as a witness in the trials of Paul Bolo Pasha (q.v.) and of the editor of the *Bonnet Rouge* and the other persons indicted for treasonable commerce with the enemies of France as a result of the Bolo exposé. For later developments see France — History.

CAILLETET, kạ-yē-tā, **Louis Paul**, French chemist: b. Châtillon-sur-Seine 1832; d. 1913. He studied at the School of Mines in Châtillon and subsequently gave especial attention to original research. He succeeded in liquefying oxygen and nitrogen in 1877, forestalling by a few days a similar discovery by a Swiss chemist, and was at once elected corresponding secretary of the Académie des Sciences, becoming a full member in 1884. He was made an officer of the Legion of Honor in 1889.

CAILLIAUD, kạ'yō', **Frédéric**, French traveler: b. Nantes, France, 9 June 1787; d. there, 1 May 1869. In examining the mineral resources of Egypt he rediscovered the ancient emerald mines of Jebel Zobara, near the Red Sea; and his report of a journey to Siwah led to its annexation by Egypt in 1820. In 1821–22 he accompanied Ibrahim Pasha's expedition to the White Nile, and his 'Voyage à Méroé' (1826–27) contained the first reliable information of that district. On a mummy bought from him by the French government a Greek translation was added to the usual hieroglyphic inscription, which aided Champollion in his researches in the Egyptian language. He also published 'Voyage à l'oasis de Thebes' (1821). In 1827 he settled as conservator of the Natural History Museum at Nantes. He published also 'Voyage à l'oasis de Syouah' (1823); 'Recherches sur les arts et métiers, les usages de la vie civile et domestique des anciens' (1837).

CAILLIE, kạ-yā, **René**, French traveler: b. Mauxé, Poitou, France, 19 Sept. 1709; d. Paris, 8 May 1838. He became an African traveler early in his career, obtaining his living by trading with the Moors, who taught him Arabic. On his travels he dressed in Arabic style and passed as an Egyptian. Having gone to Senegal he learned that the Geographical Society of Paris had offered a premium of 10,000 francs to the first traveler who should reach Timbuctoo. On 13 June 1827 he reached for the first time the shores of the Niger, which he crossed. He then traveled about 200 miles eastwardly over territories never visited before, arriving at Timé 3 August. Here he was detained by illness until 9 Jan. 1828, when he struck on a new road previously unknown to geographers, and reached Jenne on 11 March. Here he embarked for Timbuctoo, where he arrived about 11 April, after one month's sail on the Niger. After a short stay of a fortnight, and after a tedious and painful return passage through the desert, he reached Fez, 12 August, and from there returned to France. On his arrival at Toulon he was received with the utmost enthusiasm. He was the first European who ever returned from Timbuctoo, and who had achieved success, while expeditions supported by government had resulted in failure. A special prize of 10,000 francs was awarded to him by the Geographical Society, with the annual prize of 1,000 francs for the most important discovery. The order of the Legion of Honor was conferred upon him by the King, and he became, at the same time, the recipient of a salary in connection with an office, to which he was appointed in the Senegal service. Furthermore, a pension from the fund set apart for eminent literary and scientific men was decreed to him by the Minister of the Interior, and his 'Journal d'un voyage à Temboctou et à Jenné, dans l'Afrique centrale,' with geographical data added by Jomard, was published at the expense of government, and appeared at the beginning of 1830 in three volumes.

CAIMAN. See CAYMAN.

CAIN, the eldest son of Adam and Eve; the first murderer, who slew his brother Abel. God drove him from His presence, but relieved his fears by appointing for him a sign, "lest anyone finding him should smite him." For the biblical account of Cain and his descendants see Gen. iv–vii. Modern biblical scholars assume that Genesis iv is a composite of stories relating to several Cains. The posterity of Cain became extinct at the flood. Cain founded the first city, which he named after his son Enoch, and his descendants were the first inventors and promoters of the useful and agreeable arts. Josephus relates that he became the leader of a band of robbers, committed all sorts of licentiousness, corrupted the simplicity of primitive manners by his luxury, established the right of property by setting up landmarks and was the inventor of weights and measures. A Gnostic sect of the 2d century were called "Cainites." See RELIGIOUS SECTS. Consult Stade, 'Das Kainzeichen' (in *Zeitschrift für alttestamentliche Wissenschaft,* Vol. XIV, pp. 250ff, 1884); Driver, 'Book of Genesis' (1904); Gordon, 'Early Traditions of Genesis' (1907); Cheyne, 'Cain' (in 'Encyclopedia Biblica'); Schmidt, 'Messages of the Poets' (pp. 290ff, 1911); Gunkel, 'Genesis' (3d ed., 1913).

CAIN, kạ-ăṅ, **Auguste Nicolas,** French sculptor: b. Paris, 4 Nov. 1822; d. there, 7 Aug. 1894. He was in early life a carpenter, but subsequently studied under Guionnet and Rude, and devoted his attention chiefly to groups of animals. He received the bronze medal in the great exhibition of 1851, another medal in 1864 and a third at the Universal Exposition in 1867. His largest work was the monument of Duke Charles of Brunswick for Geneva — an equestrian statue representing two lions and a griffin in red marble. Among noted works by him are 'Eagle Defending its Quarry' (1852); 'Combat Between Two Tigers' (1878); 'Rhinoceros Attacked by Tigers.'

CAIN, Richard Harvey, American clergyman: b. Greenbrier County, Va., 12 April 1825; d. Washington, D. C., 18 Jan. 1887. He entered the ministry at an early age; was elected to the South Carolina Constitutional Convention in 1867, and to the State senate in 1868; and was a member of Congress 1876–80. He was made bishop in the African Methodist Episcopal Church and placed in charge of the churches in Louisiana and Texas, and later was transferred to the first Episcopal district of that Church. While in Texas he organized Paul Quinn College in Waco.

CAIN, William, American civil engineer: b. Hillsboro, N. C., 14 May 1847. He was graduated from the North Carolina Military Institute and has been professor of mathematics and civil engineering in the University of North Carolina since 1889. He has published 'Theory of Voussoir, Solid and Braced Arches' (1874); 'Maximum Stresses in Framed Bridges' (1878); 'Solid and Braced Elastic Arches' (1879); 'Symbolic Algebra' (1884); 'Practical Designing of Retaining Walls' (1888); 'A Brief Course in the Calculus' (1905); and contributions to scientific journals.

CAINE, (Thomas Henry), Hall, English novelist and dramatist: b. Runcorn, Cheshire, 14 May 1853. He received his education in the Isle of Man and at Liverpool, and qualified as an architect, but abandoned architecture in order to become a journalist. He lived in London with Dante Gabriel Rossetti from 1881 till the latter's death in 1882, and in that year appeared his 'Recollections of Rossetti.' He had previously published 'Richard III and Macbeth' (1877), a critical work, and 'Sonnets of Three Centuries' (1882). In 1883 appeared his 'Cobwebs of Criticism'; and in 1887 he contributed to the Great Writers series a 'Life of Coleridge.' His first novel was 'The Shadow of a Crime' (1885), followed by 'A Son of Hagar'; but 'The Deemster' (1887) first brought him fame. His subsequent novels include 'The Bondman' (1890); 'The Scapegoat' (1891); 'The Prophet' (1892); 'The Manxman' (1894); 'The Christian' (1897); 'The Eternal City' (1901); 'The Prodigal Son' (1904); 'The White Prophet' (1909); 'The Woman Thou Gavest Me' (1913). His most successful novels deal with Manx life, in the description of which he reveals intimate knowledge of his subject and considerable literary power. His principal novels have been successfully dramatized. In 'My Story' (1908) he records the earlier years of his literary life.

CAINOZOIC. See CENOZOIC.

CAIQUE, kä-ēk', a light boat or skiff much used in the Levant, and particularly in the Bosporus.

CAIRD, kãrd, Edward, Scottish philosopher: b. Greenock, 22 March 1835; d. Oxford, 1 Nov. 1908. He was educated at the universities of Glasgow and Oxford; was a fellow and tutor of Merton College, and was professor of moral philosophy at Glasgow from 1866 till 1893; and in 1893 succeeded Benjamin Jowett as master of Balliol College, Oxford, a position he held with much distinction until his retirement in 1906. He is author of ‘Account of the Philosophy of Kant’ (1878); ‘Social Philosophy and Religion of Comte’ (1885); ‘Hegel’ (in ‘Blackwood's Series of Philosophical Classics,’ 1883); ‘Critical Philosophy of Kant’ (1889); ‘Essays on Literature and Philosophy’ (1892); and ‘The Evolution of Religion’ (1893); ‘Evolution of Theology in the Greek Philosophers’ (1904); ‘Lay Sermons and Addresses’ (1907); ‘Essays on Literature’ (1909). He is a brother of John Caird (q.v.).

CAIRD, John, Scottish theologian: b. Greenock, 15 Dec. 1820; d. London, 30 July 1898. He was educated at the Grammar School of Greenock, and at Glasgow University, where he took a high place both in arts and divinity. Having entered the ministry of the Church of Scotland, in 1845 he became minister of Newton-upon-Ayr, and two years later was transferred to Lady Yester's parish, Edinburgh. Between that date and 1862, when he became professor of divinity in Glasgow University, he was minister of Errol, Perthshire (1849–57) and of Park Church, Glasgow (1857–62). In 1873 he was elected principal of his university, a position which he held till his resignation in 1898. He died before his resignation had taken effect. He was generally recognized in Scotland as the most powerful preacher of his time. He published sermons (his sermon ‘Religion in Common Life,’ preached before the Queen, had an immense circulation, and was described by Dean Stanley as the greatest single sermon of the century); ‘Introduction to the Philosophy of Religion’ (1880); and ‘Spinoza’ (1888) in ‘Blackwood's Philosophical Classics.’ In 1899 appeared ‘The Fundamental Ideas of Christianity,’ under the editorship of his brother, Edward Caird (q.v.), accompanied by memoir of the author.

CAIRN, kãrn (Gaelic *carn*), a name given to heaps of stones, common in Great Britain, particularly in Scotland and Wales, generally of a conical form. Some are evidently sepulchral, containing urns, stone chests, bones, etc. Others were erected to commemorate some remarkable event, and others appear to have been intended for religious rites.

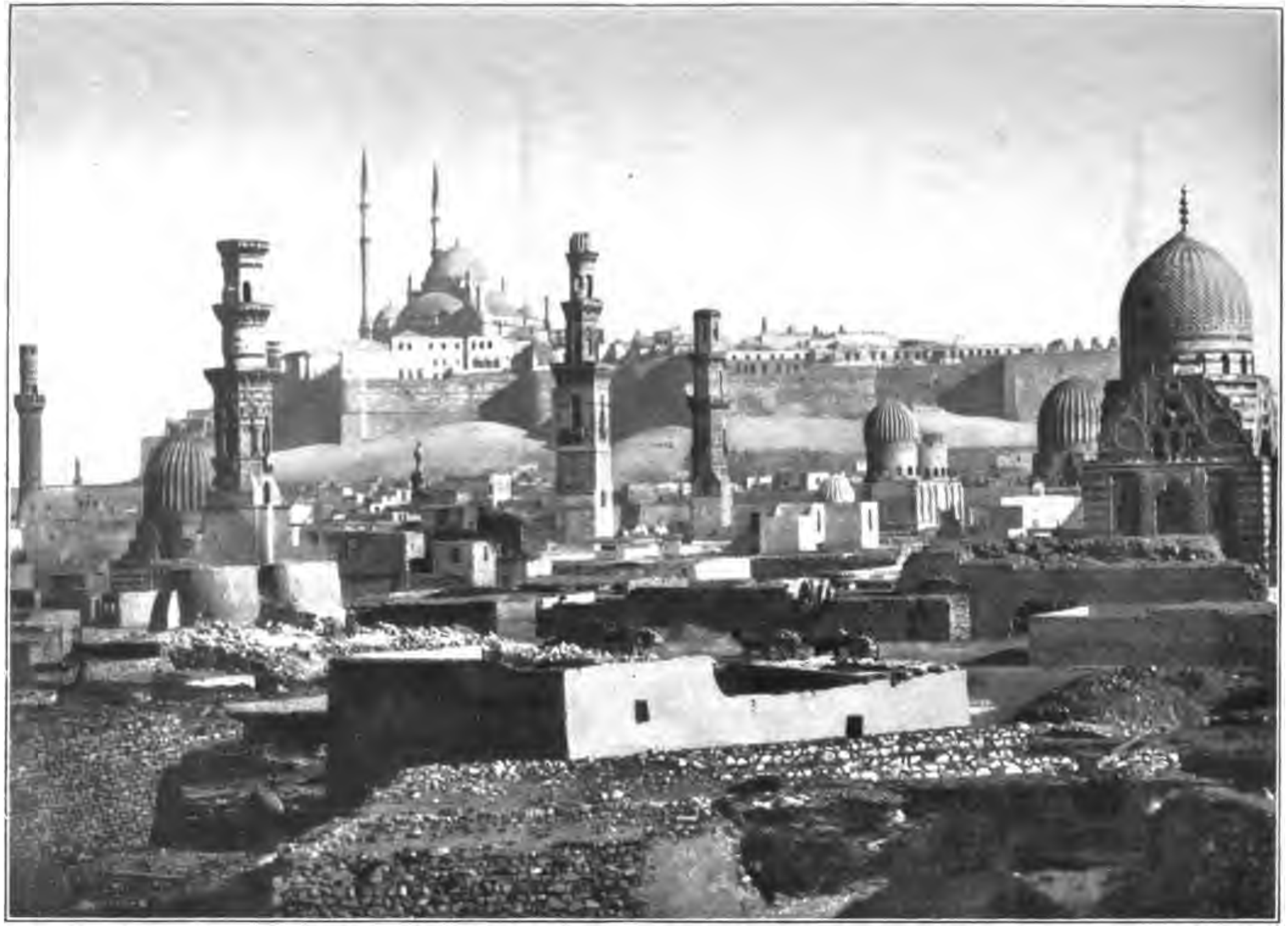
CAIRNES, kãrnz, **John Elliot,** British political economist: b. Castle Bellingham, County Louth, 26 Dec. 1823; d. London, 8 July 1875. After an education at Kingstown and Chester he was for a time employed in his father's brewery at Drogheda, but ultimately went to Trinity College, Dublin. He was graduated in 1854, and two years afterward was appointed Whately professor of political economy at Dublin. His first series of lectures was published in 1857, under the title ‘The Character and Logical Method of Political Economy.’ In 1859 he was elected professor of political economy and jurisprudence in Queen's College, Galway, and seven years later was appointed to the corresponding chair in University College, London; but in 1872 the state of his health compelled him to give up active teaching. He had been called to the Irish bar in 1857, but he hardly ever practised. During the later years of his life he suffered much from the effects of an accident to his knee, which befell him while hunting in 1860, and for some time before his death was completely crippled. In 1862 he issued a work in defense of the Northern States of America, entitled ‘The Slave Power,’ which created a profound impression. The most important of his other works are ‘Essays on Political Economy, Theoretical and Applied’ (1873); and ‘Some Leading Principles of Political Economy Newly Expounded’ (1874). He takes rank as one of the leading economists of the 19th century.

CAIRNGORM, kãrn-gōrm' (that is, “blue cairn”), a mountain of Scotland belonging to the Grampian Hills, on the border of Banffshire and Inverness-shire, three miles north of Ben Macdhui in Aberdeenshire. Its summit is 4,084 feet above the level of the sea, and its sides are clothed with pine forests. The group of mountains to which it belongs is known as the Cairngorm Mountains. It is particularly celebrated for the regular, brownish yellow crystals of quartz found on it and known as cairngorms. These are also found in many other places, and are much used for seals, brooches, etc. Specimens weighing a good many pounds are sometimes found.

CAIRNS, kãrnz, **Hugh McCalmont Cairns** (1st Earl), Irish lawyer and parliamentary debater: b. County Down, Ireland, 1819; d. Bournemouth, England, 2 April 1885. He was called to the bar at the Middle Temple in 1844, was returned to Parliament for Belfast in 1852 and quickly made his mark in the House by his fluency and readiness in debate. He became Queen's counsel in 1856, in 1858 solicitor-general, and in 1866 attorney-general under Lord Derby. Later in the same year he was a judge of appeal, and in 1867 was created Baron Cairns. Under Disraeli's premiership he became Lord Chancellor in 1868, and again in 1874, and was created Earl Cairns in 1878. For some years he led the Conservatives in the House of Lords with dexterity and vigor, and is ranked among the finest parliamentary orators of his time.

CAIRNS, John, Scottish theologian: b. Berwickshire, 23 Aug. 1818; d. Edinburgh, 14 March 1892. He was ordained at Berwick in 1845, where he remained till 1876, becoming also in 1867 professor of theology in the United Presbyterian Church, and principal in 1879. He was an eminent preacher of a healthy evangelical type, and among his works were ‘Life of John Brown, D.D.’ (1860); ‘False Christs and the True’ (1864); and ‘Unbelief in the 18th Century’ (1881). Consult Cairns, ‘Principal Cairns’ (1903); A. MacEwen, ‘Life and Letters of John Cairns’ (London 1895), and his brother's memoir in the ‘Famous Scots’ series (1903).

CAIRO, kī'rō (Arabic *El Kâhira,* “The Victorious,” or *Masr el Kâhira*), Egypt, capital of the country and largest town of Africa, situated on the right bank of the Nile, about nine miles above the point where it divides to form



TOMBS OF THE MAMELUKES, CAIRO

the two main branches of its delta. The town is built between the river-bank and the northwestern end of the hills known as Jebel Mokattam, on whose most advanced spur the citadel stands in a commanding position well above the rest of the city. Within the last 50 years the town has lost much of its Oriental character, but the Arab quarters still present a maze of very narrow streets lined by curious buildings in an endless variety of style. The houses are mostly built of yellow limestone, with flat roofs; and many of them have small gardens behind. In the more modern parts of the city the streets are broader, and many of them are lined by trees and well lighted. The European quarter, known as Ismailiyeh, forms the western part of modern Cairo, and its centre is the octagonal Ezbekiyeh Garden (20½ acres), with plants from many regions and with an artificial pond. Here, too, are many cafés, concert-halls and other similar buildings. Among the more notable buildings of the European quarter are the consulates, the opera-house, open in winter, the Italian summer theatre, English and German churches, the ministerial offices and the barracks. The chief business street of Cairo, known as Muski, runs east-southeastward from the neighborhood of the Ezbekiyeh, and the Boulevard Mehemet Ali extends from about the same place southeastward to the citadel. Cairo has more than 500 mosques, but many of them are wholly or partly in ruins. The finest of all is the Sultan Hasan Mosque, a truly noble building with a lofty minaret. Others worthy of mention are: that built in the 9th century by Ahmed ibn Tulûn in imitation of the one at Mecca; the Hakim Mosque, dating from the beginning of the 11th century; the Hosen Mosque of the Son of Ali, Mohammed's son-in-law; the Sitti-Zeynab Mosque, named after a grandchild of the Prophet, and the Alabaster Mosque of the citadel, with the tomb of Mehemet Ali, the finest of the modern mosques. Cairo is one of the great educational centres of the Mohammedan world, the chief of the schools being that associated with the mosque of El Azhar, attended by 8,000 students, and having behind it the history of nearly a thousand years. The tombs in the burying-grounds outside the city, many of them in the form of mosques, are remarkably interesting, especially those known as the tombs of the caliphs. The most important gate of the city is the Bab-en-Nasr, through which large numbers of pilgrims pass every year on their way to Mecca. The mosques contain valuable libraries, but the chief library of the city is the vice-regal one, founded in 1870, and now containing about 60,000 volumes, largely in manuscript. The trade of Cairo is large and the bazaars and markets are numerous, there being special bazaars for gold- and silver-smiths, tapestry merchants, saddlers, armorers, shoemakers, etc. It has also a large cotton industry. Beside the numerous Mohammedan places of worship Cairo contains English, French, German, Coptic and other churches and Jewish synagogues, and there are European schools and hospitals. The Egyptian Institute, founded at Alexandria in 1859, is now located in Cairo.

The suburb of Bulak, in the northwest of the town, opposite the island of Bulak, forms the port of Cairo, and its narrow streets present a busy scene of Oriental life. The island of Bulak and the left bank of the Nile are reached by a great iron bridge, and there is also a railway and general traffic bridge below the island. To the southwest of the modern town and also on the Nile bank stands the suburb of Old Cairo or Masr el-Atika. On the left bank of the river, almost directly opposite Old Cairo, is the suburb of Gizeh. It has government buildings, a zoological garden, etc., but its chief attraction is the great Egyptological Museum formerly in Bulak, but removed here in 1889. From Gizeh a road and a tramway lead southwestward to the famous group of pyramids called the pyramids of Gizeh. On the island of Roda, between Gizeh and Old Cairo, the celebrated Nilometer still stands. Cairo enjoys a very mild climate, and is in consequence visited in winter by many Europeans suffering from chest and lung ailments. Many of these stay at Helwan, a small place about 14 miles south-southeast of the town. Cairo is in railway communication with Alexandria, Damietta, Suez, etc., and with Upper Egypt, and the Fresh-water Canal connects it with Ismailia and Suez. In 1896 electric tramways were introduced in the most important streets. Cairo is the residence of the Khedive, the seat of a Coptic and a Greek Orthodox patriarch, and it contains all the highest public offices of the country. El-Fostat, «The Tent,» now Old Cairo, was founded by Amru, lieutenant of Caliph Omar, in 640 A.D. In 969, when the Fatimite dynasty gained possession of the country, the new city to the north was founded. Saladin surrounded it with walls of stone and built the citadel. He also constructed a wooden aqueduct from the Nile to the citadel, a work afterward replaced by the still existing aqueduct of stone. Cairo was taken by the French in 1798, and passed into the hands of the Turks in 1801. The city was occupied by the British in 1882, after the battle of Tel-el-Kebir and has since remained in their hands. Pop. (1911) 654,476, including Fellahin, Copts, Turks, Arabs and other Orientals, besides about 53,000 foreigners from the chief European countries, especially Italy, Greece, France, Austria, England and Germany. Nowhere in the world do the contrasting civilizations of East and West blend more picturesquely than in Cairo.

CAIRO, Ill., city, port of entry and county-seat of Alexander County, situated at the junction of the Mississippi and Ohio rivers, in the southernmost part of the State, with Kentucky on the east and Missouri on the west, 150 miles southeast of Saint Louis, on the Illinois Central, Cleveland, Cincinnati, Chicago and Saint Louis and other railroads. The city was first settled in 1838 by William Bird and was incorporated as a city in 1857. It was expected to become a great commercial centre. Cairo has a commission government, administered by a mayor and four commissioners. It has a large transit trade in agriculture and lumber, and affords a good market for the produce and trade of the Mississippi Valley. The industries include sewing-machine factory, box factories, handle factory, flour mills, wagon works, foundries, etc. The United States census of manufactures for 1914 reported 61 industrial establishments of factory grade, employing 1,769 persons, of whom 1,522 were wage earners, receiving annually $853,-

000 in wages. The capital invested aggregated $3,474,000, and the year's production was valued at $4,584,000; of this, $1,538,000 was the value added by manufacture. The city has four banks with a combined capital of $4,806,690. A United States custom house is located in Cairo and it has a free public library, courthouse, United States Marine Hospital, Saint Mary's Infirmary and Bondurant Hospital. The Federal government during the Civil War used the town as a depot for military supplies. For many years, until levees were built, the city suffered from frequent floods which greatly impeded its progress, the most disastrous of which occurred in 1858. In 1913 $250,000 was appropriated by the State for the repair of levees within the city limits; it is the «Eden» of Dickens' 'Martin Chuzzlewit.' The city is growing in wealth and population, has many fine churches and an excellent system of education with six white schools, five colored schools and two parochial schools. The value of its taxable property is $11,000,000. Pop. (1910) 14,540; (1916) 17,000.

CAISSON, a water-tight chest or casing, used in the construction of bridges, quays, etc., large enough to contain an entire pier, which is built in it, the caisson being sunk to the bed of the river. (See FOUNDATION). The pneumatic caisson has an air-chamber in which men may work at the bottom of the water, air pressure being maintained within the caisson sufficient to keep the water out, and the air-space being entered by what is called an air-lock. This form of caisson is used where the water is too deep or the bottom too rocky to permit of the construction of a coffer-dam. The name is also applied to an air-tight structure which is sunk below a vessel by the admission of water, and raises the vessel when the water is pumped out, although the commoner name for this form is «pontoon.» It is also used to designate the hollow boat-shaped gate used to close the entrance to a dry dock. (See HARBORS). In military language, the term is applied to the ammunition carriage attached to a battery of artillery. In architecture caisson signifies a panel left in a vaulted ceiling or more rarely in a flat ceiling or a wall. They are sometimes square, but the most common arrangement is a pattern of sunken octagons with much smaller sunken squares set diagonally between. The caisson may be decorated with mouldings and ornaments of stucco painted and gilded.

CAISSON DISEASE, or **COMPRESSED AIR DISEASE**, a disorder occurring among workers in compressed air, who are submitted to a pressure of two or three atmospheres, as in bridge-caissons. The symptoms of the disease do not appear while the workman is under compression but come on after decompression when some minutes or even hours have elapsed. The symptoms were at first thought to be due to mechanical pressure which by producing changes in the distribution of the blood caused congestion or blood stases when pressure was removed. This, however, is contrary to the adaptability of body fluids to pressure and does not agree with experimental evidence. The gas emboli theory is now generally accepted. According to this theory blood in compressed air absorbs an increased amount of oxygen and nitrogen which under compression is distributed to the fluids of the various parts of the body. If now rapid decompression takes place bubbles of gas form in the blood more rapidly than the gas can be cast off by the lungs and numerous capillary emboli result. These then cause pain in local regions, either by direct or mechanical force, or by cutting off the local blood supply. There may be more or less general pain involving two or three or all of the extremities and sometimes severe abdominal pain with prostration, which in some cases result in unconsciousness, collapse and death. These symptoms are due to the presence of cord or brain lesions, the result of the gas emboli in the blood supply to the central nervous system. Vertigo with deafness and occasional labyrinthine hæmorrhage are sometimes present and probably point to embolism in the labyrinth. Dyspnœa and sense of constriction in the chest are also sometimes present but are not fatal. The most successful treatment is that of recompression with gradual decompression carried on in a medical air-lock. This is now required by law in some countries. Prophylactic measures are carried out by careful examination of the workman and elimination of those unfitted for work in compressed air. Predisposing factors are youth or too advanced age, alcoholism, organic disease and fatness. New men should be given a short shift and workmen should be carefully supervised. Fatigue is also a factor. Certain countries and states already have laws regulating shifts and providing for gradual decompression, gauged according to the pressure undergone, which are the chief preventive measures.

SMITH ELY JELLIFFE.

CAITÉS, or **CAETÉS**, kä-e-täz', an extinct tribe of Brazilian Indians which, up to the close of the 16th century, inhabited a large portion of the eastern coast region north of the Sao Francisco. Of the Tupi race, they were more warlike than other branches of that family, and, while they exhibited traits that indicated at least a crude sort of civilization, such as life in fixed villages and the practice of agriculture, they were the most cannibalistic of all the Brazilian tribes. In 1554 they murdered the bishop of Bahia and his companions, who were shipwrecked on that coast, and their ravages upon the settlements of the colonists aroused an enmity that finally resulted in their complete extinction.

CAITHNESS, käth'nĕs, a maritime county in the extreme northeast of the mainland of Scotland; area, 686 square miles. The surface is generally level or undulating, and there are few hills of any height, except on the Sutherland border. Much of the surface is deep moss or peaty moor, but there is a fair proportion of fertile land in the eastern part. About one-quarter of the whole surface is under crops and rotation grasses, or in permanent pasture. Of corn crops oats is by far the most important. Sheep farming is largely engaged in, and a considerable area is under deer forest. Only a very small portion of the country is wooded. The coast, north and east, is prevailingly bold and rocky; in the southeast low and sandy. The chief headlands are Dunnet Head on the north coast, Duncansby Head at the northeast corner, Noss Head and the Ord on the east coast. The largest bays are

Dunnet Bay on the north and Sinclair's Bay on the east; but Thurso Bay and Wick Bay are also noteworthy. There are many lakes, some of them very attractive. The largest is Loch Watten, near the centre of the county. There are no navigable rivers. Caithness is poor in metallic minerals, but excellent flagstones have been quarried for many years and form one of the chief exports of the county. Many of the inhabitants are engaged in fishing, and Wick is one of the chief centres of the Scottish herring-fishery. The manufactures are subsidiary to its other industries. Wick, the county town, is a royal burgh, and Thurso is the only other town. The antiquities of Caithness are numerous, and include old castles, so-called Picts' houses, monoliths, etc. The country returns one member to Parliament. Pop. (1911) 32,010.

CAIUS, kä'yūs. See GAIUS.

CAIUS, kēz, **John,** English physician, the founder of Caius College, Cambridge University: b. Norwich, 6 Oct. 1510; d. Cambridge, 29 July 1573. His name was Kaye or Key, which he Latinized into Caius. He took his degrees at Gonville Hall, Cambridge, and was chosen fellow of his college. While at Cambridge he distinguished himself by various translations from the classics. He spent some time in traveling on the Continent, studied medicine at Padua, under Montanus and Vesalius, and took his doctor's degree at Bologna (1541). In 1542 he lectured at Padua on the Greek text of Aristotle, and in the following year made a tour through Italy, visiting the principal libraries, in order to compare the manuscripts of Galen and Celsus. He returned to his native country in 1544, and practised, first at Cambridge, then at Shrewsbury, and afterward at Norwich. He was appointed by Henry VIII lecturer on anatomy to the Company of Surgeons, London. In 1547 he became fellow of the College of Physicians, and was appointed court physician to the young King Edward VI, which appointment he retained under the queens Mary and Elizabeth. In the reign of the latter, an exciting controversy arose between the surgeons and physicians of London, as to the right of the former to administer internal remedies for sciatica. Caius argued the negative so ably on behalf of the physicians that the decision was against the right of the surgeons to continue the practice of administering medicines. He was elected president of the College of Physicians for seven years in succession. There is extant a book of the college annals from 1555 to 1572 written by him in Latin, the earliest account we have of the transactions of that college. He was dismissed from the royal service in 1568 on suspicion of favoring the Catholic party. He obtained permission to endow and raise Gonville Hall into a college, which still bears his name (Gonville and Caius College), and accepted the mastership thereof. His last days were passed in the seclusion of his college. His works are numerous, on various subjects; many of them have been reprinted in modern times. See his 'Works,' edited by J. S. Roberts, with memoir by J. Venn (New York 1912).

CAIUS CESTIUS, kä'yūs ses'ti-us, **Pyramid of,** a sepulchral monument, a pyramid of the time of Augustus, standing at Rome. Built of brick and stone and encrusted with white marble, it is more than 114 feet in height, while each side of the base measures 90 feet. This contains a small burial chamber, which is painted with arabesque.

CAIUS COLLEGE. See GONVILLE AND CAIUS COLLEGE.

CAIVANO, kī-vä'no, Italy, a city lying north of Naples, at a distance of about five miles, and connected with the latter by tramway. It was a fortified town in the Middle Ages, and at present is interesting as the centre of a fertile agricultural district that produces fruits, wine, olives, grain, hemp, etc. There are also a few manufactories. Pop. about 13,000.

CAIX, kä-ēks, **Napoleone,** Italian philologist: b. Bozzolo, near Mantua, 1845; d. 1882. His education was obtained at Cremona and Pisa, and in 1869 he was called to the chair of ancient languages in the Lyceum of Parma, becoming professor of Romance languages and comparative philology in the Institute of Higher Studies in Florence in 1873. He was a prolific writer, and among his many works are 'Saggio sulla storia della lingua e dei dialetti d'Italia' (1872); 'Sulla lingua del Contrasto' (1876); 'Le origini della lingua Poetica Italiana' (1880).

CAJAMARCA, kä-hạ-mär-ca', or **CAXAMARCA,** Peru, the name of a department and city in the valley of the upper Marañon, or Amazon. The department lies in a very mountainous region. Pop. 213,391. The city stands on the eastern declivity of the Andes in a rich silver mining district, 75 miles from Trujillo. It lies about 350 miles to the northwest of Lima, has broad and well-paved streets and several plazas or squares. The climate is equable, the temperature being very moderate because of the elevation. It contains several handsome churches and flourishing manufactories of steel articles, straw hats, cotton goods, woolens and cutlery. The inhabitants are considered the best workmen in silver and iron in Peru. An extensive trade between the inland provinces and Lambeyeque and Truxillo is carried on through this town. Woolen fabrics form the chief exports, and European manufactures, sugar, brandy, wine, iron, steel and other articles are imported in return. In the vicinity are the baths of the Incas, and a volcanic lake, into which, according to tradition, were cast the throne and regalia of the Peruvian monarchs, the last of whom, Atahualpa, perished here in 1533 by the hands of Pizarro. Pop. about 9,000.

CAJEPUT, kăj'ẹ-pŭt, or **CAJUPUT OIL,** the volatile oil obtained by distillation from the leaves of the cajeput-tree (*Melaleuca cajupti* or *minor*), belonging to the order *Myrtaceæ*. This tree has lanceolate, aromatic leaves and spikes of odorless flowers, and is common in many islands of the Malay Archipelago, India and the hot sections of Australia. Booro, one of the Moluccas, yields the bulk of the oil exported, although much comes from Celebes. It is mostly sent to Singapore, when it is re-exported to other countries. The oil is of a pale-green color, very limpid, lighter than water, of a strong smell, resembling both turpentine and camphor, and of a strong pungent taste. It is often adulterated with other essential oils. The color of the oil depends on the presence of a little copper, which must be removed by redistillation before the oil is fit for use in medicine, in which it has many applications, being used as a carminative, an antispasmodic, a rubefacient and a sudorific. The active principle of cajeput oil is the camphor «cineol» ($C_{10}H_{18}O$). *Kayuputi*, the native name of the tree, means «white wood,» and refers to the color of the bark.

CAJETAN, kăj'ĕ-tan, or **CAJETANUS, Tommaso de Vio**, Italian cardinal: b. Gaeta, 25 July 1470; d. Rome, 9 Aug. 1534. He entered the order of Dominican friars, graduated as a doctor and was elected general of his order in 1508. When Pope Julius II was summoned to appear before the council of cardinals assembled at Pisa and afterward at Milan, in the interest of King Louis XII of France, Cajetan undertook his defense, asserting that to the Pope alone belonged the power of convening a council. He was appointed cardinal in 1517 by Leo X, and sent as a legate in Germany to bring the Emperor Maximilian and the King of Denmark into the league formed against the Turks. His efforts to make Luther recant his doctrines proved in vain. In 1519 he was present, as Roman legate, at the assembly of the electors of the empire, and sided with the partisans of Don Carlos of Spain, who was elected emperor under the name of Charles V. Then he returned to Rome, but was soon ordered by Adrian VI to Hungary, which was invaded by the Turks. In 1524 he was recalled to Rome by Clement VII. On the capture of Rome in 1527, being taken prisoner by the imperial troops, under the command of the Constable of Bourbon, he had to pay 5,000 crowns as a ransom for his liberty. He made a translation of the Old Testament, with a commentary, and wrote a treatise on the authority of the Pope, which was answered by the faculty of the University of Paris. He also wrote commentaries on parts of Aristotle's writings and on the 'Sumara' of Aquinas. The latter is reprinted in the definitive edition of the great Aquinas issued under the patronage of Leo XIII (Rome 1882). A collection of his work to which his life is prefixed appeared at Lyons in 1639 (5 vols.). Consult Schilbach, 'De Vita ac Scriptis de Vio Cajetani' (1881).

CAJIGAL, kä-hē-gäl, **DE LA VEGA, Francisco Antonio**, Spanish colonial governor: b. Santander, 5 Feb. 1695; d. there, 30 April 1777. He held the post of governor of Santiago, Cuba, 1738–47, and in 1742, during the course of the war between Spain and England, repelled an attack by Admiral Vernon. He was governor-general of Cuba 1747–60, and while in office established an arsenal and navy yard at Havana. During a part of 1760 and the year following he was viceroy of Mexico. Withdrawing to Spain after this, he became councillor of the War Department (1761), and on the outbreak of hostilities with England in 1762 went to the front and fought in Portugal under the orders of the Count of Aranda. After the war, he returned to the Council of War, whose dean he became in 1768.

CAJORI, cā-jō'rē, **Florian**, Swiss-American mathematician: b. Saint Aignan, Switzerland, 28 Feb. 1859. He came to the United States in 1875 and studied at the University of Wisconsin and at Johns Hopkins and Tulane universities. In 1885–88 he was professor of mathematics at Tulane and removed to Colorado College in the latter year, where he became professor of physics and mathematics and later dean of the School of Engineering. He has published 'The Teaching and History of Mathematics in the United States' (1890); 'A History of Mathematics' (1894); 'A History of Elementary Mathematics' (1896); 'A History of Physics' (1899); 'Introduction to the Modern Theory of Equations' (1904; 1912); 'A History of the Logarithmic Slide Rule' (1909).

CAKCHIQUEL, käk-chē-käl', a tribe of Mayan stock occupying northern and central Guatemala. They are probably an off-shoot of the Quichés, as they resemble that tribe closely in customs and language. They were conquered by Alvarado in 1524, and at that time had a well-developed civilization, as is shown by their architectural ruins and their system of hieroglyphic writings. They had an intense religious veneration for maize, and it is even probable that they were the first to cultivate it. Consult Brinton, 'Annals of the Cakchiquels' (Philadelphia 1885); Stoll, 'Zur Ethnographie der Republik Guatemala' (Zürich 1884); Thomas and Swanton, 'Indian Languages of Mexico and Central America' (Washington 1911).

CAKE-URCHIN, SAND-CAKE or **SAND-DOLLAR**, a flat, round sea-urchin two or three inches in diameter (*Echinarachnius parma*) which lives buried in the sand in the shallow portions of the north Atlantic, from low-water mark to 40 fathoms. It is occasionally thrown ashore on beaches. The body is protected by limestone plates, and the «ambulacra,» or delicate suckers, are arranged in a rosette on the upper side of the animal, the mouth being on the under side. See also SEA-URCHIN.

CALABA OIL, an excellent illuminating oil obtained from calaba-nuts, the seeds of *Calophyllum calaba*, a tree of the order of *Guttiferæ* that flourishes in Brazil and the West Indies, and yields useful timber. The yield of oil is from 50 to 55 per cent of the weight of the nuts after they are divested of their shells — equivalent to about 30 per cent of their gross weight. The oil consists of the glycerides of palmitic, stearic and oleic acids, and contains about 15 per cent of a greenish resin which is poisonous, and renders the oil inedible. It is, however, used medicinally. Calaba oil solidifies at 38° F., and melts again at 46°. Its saponification value is 196.

CALABAR, kä-lä-bär', or kal-ą-bär', Africa, the former name of a district on the west coast, extending eastward from the Niger delta, and now included in the Niger Territories. The name is now applied to two towns and two rivers in that region. Old Calabar is a port in southern Nigeria, situated on the east bank of the estuary of the Cross River at the point where it receives the waters of the Old Calabar River. It contains, among other buildings, a Presbyterian Mission Institute for natives, a large prison, good hospitals and marine workshops. Its climate, like that of all coast settlements in this part of the continent, is very unhealthful. The rainfall is very great, tornadoes are frequent and the temperature is very high. The value of its exports, consisting chiefly of palm-oil, palm kernels, and rubber, exceeds $1,000,000, and its imports are valued at rather more. New Calabar is situated farther east on one of the mouths of the Niger known by the same name. Its trade is less than that of Old Calabar, but is nevertheless of considerable value. Since 1904 the official style of Old Calabar has been Calabar.

CALABAR BEAN, or **ORDEAL BEAN,** the brown or reddish-brown kidney-shaped seed of *Physostigma venenosum,* a climbing, woody, West African vine of the pea family (*Leguminosæ*), reaching a height of 50 feet. The flowers are purple, resembling the sweet pea, and each pod contains two or three seeds, which are about one inch long with a blackish groove along the convex edge; and in the interior an air-cavity which enables the heavy seeds to float on water. This bean is very poisonous, and has been much used in paste or in infusion in the trial by ordeal conducted by the native medicine men of West Africa. If the person accused of witchcraft or crime vomited the mixture, he was declared innocent; if he did not vomit, death ensued. At one time 70 children in Liverpool ate some of the beans; one who ate four seeds did not vomit and died; all the rest vomited and recovered. In poisoning with this bean vomiting should be encouraged, the stomach washed out and atropine administered if the dose has been small; if the dose was large atropine hastens death. Two alkaloids are prepared from the Calabar bean, calabarine and physostigmine. The latter has the largest known power of contraction upon the pupil of the eye, and is used in subcutaneous injection by oculists for this purpose. It is also used in the treatment of photophobia and glaucoma. In medicine, physostigmine is used in connection with tetanus antitoxin in the treatment of lockjaw, and also in chronic constipation and certain diseases of the bladder.

CALABASH GOURD, BOTTLE GOURD, WHITE PUMPKIN, *Lagenaria vulgaris,* the only cultivated or common wild species of its genus, which belongs to the family *Cucurbitaceæ,* distinguished from the species of the closely related genus *Cucurbita* by having white instead of yellow flowers, distinct instead of united anthers, and seeds with distended edges. It is a climbing annual vine, 30 to 40 feet long, with a musky odor and sticky texture. It is a native of tropical Asia and Africa, and is grown in warm countries for its very variable smooth, hard-shelled fruit, which, while young and soft, is used by some races as food; but much more generally the ripe fruits are used for making utensils such as dippers, cups and pitchers. Some of the largest fruits are used in India and other Eastern countries in raft-construction and for buoys. These fruits range in size from a few inches to five feet or even more, and from their resemblance to various objects are called Hercules' club, dipper, bottle, snake, sugar trough, etc. The plant is often cultivated in the southern United States, but is less frequently seen in the North, where the season is usually too short for the fruits to fully mature. A sunny exposure in warm, quick soil, and cultivation similar to that given squashes and melons, will suit the plan well.

CALABASH NUTMEG, a tree (*Monodora myristica*) of the family *Annonaceæ,* introduced into Jamaica probably from West Africa. The fruit resembles small calabashes, hence the name. It is called also American nutmeg or Jamaica nutmeg.

CALABASH-TREE, a tree (*Crescentia cujete*) of the West Indies and tropical North America, of the family *Bignoniaceæ,* about the height and dimensions of an apple-tree, with crooked, horizontal branches, wedge-shaped leaves, pale-white flowers on the trunk and branches, and a roundish fruit, from two inches to a foot in diameter. The greenish-yellow skin of the fruit encloses a thin, hard and almost woody shell, which is used for the same purposes as water-cans, goblets, cups, etc. So hard and close-grained are these shells that when they contain fluid they may even be put several times on the fire as kettles, without any injury. When intended for ornamental vessels, they are sometimes highly polished, and have figures engraven upon them, which are variously tinged with indigo and other colors. The calabash contains a pale-yellow, juicy pulp of an unpleasant taste, which is esteemed a valuable remedy in several disorders, both external and internal.

CALABAZAR, kä-lą-bą-thär', Cuba, city of the province of Santa Clara, situated 20 miles north of the city of Santa Clara. It has a fine municipal building. The Calabazar River is crossed at this point by a fine railroad bridge, the best of its kind in the country. Pop. 1,496; municipal district, 16,979.

CALABOZO, kä-lą-bō-thō', Venezuela, town in the state of Miranda (Guzman Blanco), 120 miles south-southwest of Caracas, on the left bank of the river Guarico, in the midst of the llanos. It was founded in 1730, is tolerably well built and has rather a pleasing appearance. Its church, though not very handsome, is commodious. The principal wealth of the inhabitants consists of cattle. There is a considerable trade in live stock, hides, cheese, timber, etc. The neighboring ponds abound in electrical eels. Pop. 6,000.

CALABRIA, Italy, division of the kingdom, comprising the southwest peninsula or toe of Italy, from about 40° N. lat. to the Strait of Messina; area estimated at 5,819 square miles. It was formerly divided into three provinces — Calabria Citeriore, the most northerly; Calabria Ulteriore I, the most southerly; and Calabria Ulteriore II, between the two former; but these have been renamed respectively Cosenza, Reggio di Calabria and Catanzaro. The central region is occupied by the great Apennine ridge, wild and bleak, to which, however, whole colonies with their cattle migrate in the summer. The flats near the coast are marshy and unhealthy, and inhabited by herds of buffaloes; but the valleys at the foot of the mountains are well watered and produce most luxuriant vegetation. The vine, the orange and lemon trees, the fig, the olive and all the fruits of southern climes, grow there to perfection. The climate was reckoned salubrious in ancient times; but in some places the accumulation of stagnant water produces disease in the hot season. Corn, rice, saffron, anise, licorice, madder, flax, hemp, olives, almonds, cotton and sugar-cane are raised in abundance. Sheep, horned cattle and horses are numerous. Near Reggio a kind of mussel is found, called *Pinna marina*, from whose silky byssus or beard a beautiful fabric is manufactured, remarkable for its extreme lightness and warmth. Coral is also obtained. The quarries and pits afford alabaster, marble, gypsum, alum, chalk, rock-salt, lapis lazuli and the fine copper renowned in ancient times.

Calabria corresponds with the ancient Bruttium and part of Lucania, while the ancient Calabria corresponds to the heel of Italy. It early received numerous Greek colonies, and formed part of Magna Græcia. In 268 B.C. it was conquered by the Romans. The Saracens had occupied the greater part of it when it was conquered by the Normans in the 11th century. Since then it has constantly followed the fate of the kingdom of the Two Sicilies, with which it was united to the kingdom of Italy in 1860. It was visited by continuous earthquakes from 1783–87 and suffered severely in the disastrous earthquakes of 8 Sept. 1905 and 28 Dec. 1908. The greater part of the inhabitants are poor. Formerly the country was much infested by brigands and brigandage is not yet entirely extinct. The language of the people is a corruption of the Italian. There are somewhere about 40,000 Albanians settled in Calabria, who continue to preserve their language and racial identity. Pop. (1911) 1,402,151.

CALADIUM, a genus of plants of the Arum family, consisting of a dozen species, natives of tropical South America. The plant commonly in cultivation which is known as Caladium or elephant ear is a species of the related genus *Colocasia*. Two species of *Caladium*, *C. schomburgkii* and *C. bicolor*, are popular with gardeners as foliage plants. They have large heart-shaped or angled leaves, beautifully mottled and variegated in many shades of green, red and yellow.

CALAFAT, Rumania, town of Doliju, department on the Danube, opposite Vidin, Bulgaria, with which it communicates by a steam ferry. Calafat, named after the *calfats* or ship repairers, employed by the 14th century Genoese colonists who settled here, is a great grain-trading centre served by the Wallachian Railway system. Here in 1854 the Turks won a surprise victory over the Russians. Pop. 7,500.

CALAH, kā'lạ, an ancient city mentioned in Genesis x, 12 as one of those built by Asur. It is the city called Kalchu in the Assyrian inscriptions, which say that it was founded by Shalmaneser I about 1250 B.C. It was rebuilt by Asurnazirpal III about 880 B.C., who erected a wall on the northern side and a large palace. His successors also built palaces in the city. It is now known as Nimrud, where a number of important ruins and inscriptions have been found, among them the so-called «black obelisk» which tells of the tribute paid by Jehu, King of Israel, to Shalmaneser II.

CALAHORRA, kä-lạ-ōr'rạ, Spain, a town of Old Castile, near the south side of the Ebro, in the province of Logroño, and 32 miles southeast of the city of Logroño by rail. It is a bishop's see, and contains a cathedral, three parish churches and three convents. In 78 B.C. this town, then called Calagurris, siding with Sertorius, was besieged by Afranius, one of Pompey's generals, and the inhabitants reduced to such extremity that they fed on their wives and children; whence the Romans were wont to call any grievous famine *fames Calagurritana*. Quintilian was born here about 35 A.D.. Pop. 9,871.

CALAIS, kạ-lā', France, a seaport town and fortified place of the first class, in the department of Pas-de-Calais, 20 miles northeast from Boulogne on the Strait of Dover, and about 21 miles east-southeast of the port of Dover. It is situated at the junction of several canals, and by railway is directly connected with Paris, from which it is distant 185 miles. The town consists of two portions, almost entirely separated by basins or water areas connected with the harbor accommodation. These are Calais proper or the old town farther to the north, and Saint Pierre or the new town lying to the south, now a great manufacturing centre, and incorporated with the other portion only in 1885. The whole is enclosed by a new line of circumvallation, and is also defended by a citadel and seven detached forts and batteries. On the land side the country is flat and marshy, and can be laid under water to strengthen the defenses. The streets are broad and well paved, the houses substantially built of brick, and the hotels in general excellent. The chief square is the Place d'Armes, where the old Hôtel de Ville, built in 1740 (restored in 1867), is situated. The new town hall is on Place Centrale. The principal church, Notre Dame, contains a fine altar-piece in Genoa marble. Other noteworthy objects are the Hôtel de Guise, originally founded by Edward III of England; the column erected to commemorate the landing of Louis XVIII in 1814; barracks; and the Hôtel Dessin. Calais is the seat of a commercial court and chamber of commerce, and has a college, a commercial school, school of design, school of hydrography, etc.

The harbor is accessible at all states of the tide, and is entered between two long piers. The works include extensive graving dock and wet dock accommodation. Calais is one of the principal ports for the debarkation of travelers from England, there being day and night communication with Dover by steamboat. There is a submarine cable to England from this port. The manufactures of the town are important. The silk and cotton tulle or bobbinet trade employs thousands of hands. Various other industries are also carried on, such as flax-spinning, lace-making, hosiery, engineering, net-making, brewing, etc. Vessels are built here, and fitted out for the cod, mackerel and herring fisheries. It is the entrepôt for an important district, and a considerable trade is carried on in grain, wool, wine, sugar, timber, coal, etc., and not less than 55,000,000 of eggs are annually exported to England. Calais is a town of considerable antiquity. In 1347 it was taken by Edward III of England, after a siege of 11 months. The famous incident of the six burgesses having their lives saved at the intercession of Queen Philippa belongs to this siege. In 1558 it was retaken by the Duke of Guise, being then the last relic of the French dominions of the Plantagenets, which at one time comprehended the half of France. Pop. 72,322.

CALAIS, kăl'ĭs, Me., city, port of entry, and county-seat of Washington County, situated on Saint Croix River, opposite Saint Stephen, N. B., and on the Saint Croix & P. and the Canadian P. railroads, 120 miles east of Bangor. It is the extreme northeast seaport of the United States and is connected by steamship lines with Boston, Portland and Saint John, N. B. It has a large lumber trade and numerous foundries, machine shops, shipyards, granite quarries and other extensive mechanical industries, including shoe factories, plaster works, etc.; a national bank, several newspapers, high and grammar schools, electric lights, a public library and an assessed property valuation of $2,500,000. The government is vested in a mayor and council elected annually. Pop. 6,116.

CALAMANCO, a woolen stuff made in the Netherlands, the warp of which is sometimes mixed with silk or goats' hair. It has a fine gloss, and is checkered in the warp, so that the checks are seen on one side only. It was fashionable in Addison's time.

CALAMANDER WOOD, a hard wood of Ceylon, obtained from a species of ebony-tree. See EBONY.

CALAMARY. The old European name of the 10-armed cuttle-fish. See SQUID.

CALAMATTA, Luigi, Italian engraver: b. Cività Vecchia, Italy, 12 July 1802; d. Milan, 8 March 1869. He was educated in Rome under Marchetti and Ricciani, but was much in Paris, where he was a follower of Ingres. In 1837 he became professor at the Ecole des Beaux-Arts in Brussels and among his pupils were Gustave Biot, Leopold Flameng and Charles Blanc. He founded a school of engravers in Brussels under government direction, and in his latest years was professor of drawing in the Academy of Milan. He is well known by his engraving of the head of Napoleon, from the death mask, and portraits of Ingres, Paganini, Guizot, George Sand, «Francesca da Rimini»; «La Gioconda» after Leonardo da Vinci, and the «Madonna di Foligno» after Raphael. Consult Alvin, ‘Notice sur Luigi Calamatta’ (Brussels 1882).

CALAMBA, kạ-läm'bạ, Philippines, a town of the province of Laguna, situated in the southern part of the island of Luzon, about 30 miles southeast of Manila. It is connected with several important towns by highways, and has a telegraph station. Pop. about 13,000.

CALAMBAC, aloes-wood, the product of a tree, *Aquilaria agallocha*, growing in China and some of the Indian islands. It is of a very light, spongy texture, and contains a soft, fragrant resin, which is chewed by the natives.

CALAME, kạ-läm, **Alexandre**, Swiss landscape artist: b. Vevey, Switzerland, 28 May 1810; d. Mentone, France, 17 March 1864. His life was passed mainly in Geneva, where a monument was erected to him in 1880. He was ranked among the best landscape painters of his day and he excelled the most, if not all, of his contemporaries in portraying Alpine scenery. Among works by him are ‘Bernese Oberland’ (Leipzig Gallery); ‘Wetterhorn’ (Basel Museum); ‘Lake of Lucerne’ (Berlin Museum); ‘Shreckhorn’; ‘Lake of the Four Cantons.’

CALAMIANES, kä-lạ-mē-ä'nĕs, a cluster of islands in the Philippine Archipelago, of which Busuanga, Calamian and Linacapan are the most important; Busuanga is 36 miles long and 17 miles broad. They lie between lat. 11° 25' and 12° 20' N. and about long. 120° E. The islands are mountainous and well timbered. They produce rice, cacao and great quantities of wax and honey. The principal occupations are cattle raising and fishing. The climate is unhealthful. There are about 98 islands in the group, with a total land area of 675 square miles. Pop. 17,000.

CALAMINE, a native basic metasilicate of zinc, having the formula $(ZnOH)_2SiO_3$. In England the name is applied to the carbonate ore and the name given to the silicate is smithsonite. The mineral, now known as smithsonite, was formerly included here, but James Smithson, in 1803, showed that the two species are distinct. The two are usually found together. Calamine occurs in hemimorphic, rhombohedral crystals, usually white, with a vitreous lustre, a hardness of from 4.5 to 5 and a specific gravity of between 3.4 and 3.5. It also occurs in massive forms, sometimes mammillary in shape, and often cellular. In the United States calamine is found in fine crystalline form in New Jersey, Pennsylvania and Virginia; and both crystalline and mammillary in Missouri, Utah and Montana. In localities where it occurs in quantity it constitutes a valuable ore of zinc.

CALAMINT, any plant of the genus *Calamintha*, belonging to the family *Menthaceæ*. The plants are herbs or shrubs with usually entire leaves, and dense whorls of purple-white or yellow flowers, with a two-lipped corolla and didynamous stamens not projecting from the corolla. Five species are British. They all contain a volatile oil, and a pectoral medicine is obtained from them. In the United States several species are also found.

CALAMIS, Greek sculptor, statuary and embosser of Athens; a contemporary of Phidias, who flourished between 467 and 429 B.C. Pliny bestows the highest praises upon his horses. Among his most celebrated works were a statue in metal of Apollo Alexicacos, in Athens, in 429 B.C., and which has erroneously been supposed to be the Apollo Belvedere; a colossal statue of Apollo in bronze, 30 cubits in height, which was taken to Rome by Lucullus; and a Jupiter Ammon consecrated by Pindar at Thebes. Consult Gardner, E. A., ‘A Handbook of Greek Sculpture’ (pp. 232–36, London 1911).

CALAMITE, a genus of fossil plants very characteristic of the coal measures. They occur in the Devonian rocks, and in other formations up to the Jurassic, in which one species is found. Their classification is not finally determined, but they are generally regarded as closely related to the *Equisetaceæ* or horsetails. The stalks are striated lengthwise, and interrupted with rings marking a regular articulation.

CALAMITY JANE. See BURKE, JANE.

CALAMUS, a remarkable genus of palms, the species of which are mostly Indian, and are very different from most other palms, having slender, many-jointed, reed-like stems, often stretching to a length of several hundred feet. Some have the stems erect, others climb and trail among trees on which they support themselves, hanging on by the hooked prickles that terminate their leaves. Some have leaves at intervals along the stem, others only at the extremity. The stems are hard, smooth and siliceous on the surface, and from their toughness and pliancy they are much used in the regions where they grow for matting, strong ropes, plaited work, etc. Bridges over streams are frequently made of ropes formed by twisting up their stems, and the native vessels of the Eastern seas often carry cables of the same kind.

CALAMUS, a popular name for the sweet flag (*Acorus calamus*), of the family *Araceæ*. This plant is found in wet land from Nova Scotia to Florida, and westward to Kansas and Minnesota. The pungent, bitterish, acrid root stocks have been used in medicine, especially among the colored people of the southern United States. It is sometimes cultivated as an ornamental plant in wet places, and is attractive for its erect, sword-shaped leaves, which in one variety are striped with yellow.

CALAMY, Edmund, Puritan clergyman: b. London, England, February 1600; d. there, 29 Oct. 1666. He studied at Pembroke Hall, Cambridge (1616–19), where he attached himself to the Calvinistic party, and in 1639 was chosen minister of Saint Mary's, Aldermanbury, London. He entered warmly into the controversies of the time, and became noted as a leading man on the side of the Presbyterians. He had a principal share in the composition of ‘Smectymnuus,’ a work intended as a reply to Bishop Hall's ‘Divine Right of Episcopacy’ (London 1640), and one of the most able and popular polemics of the day. Like the mass of the Presbyterian clergy, he was monarchical and not republican in his political opinions. He disapproved, therefore, of the execution of Charles, and of Cromwell's protectorate, and did not hesitate to avow his attachment to the Royalist cause. He was one of the deputies appointed to meet Charles II in Holland and congratulate him on his restoration. He took part in the Savoy Conference (1661); but was ejected from his living by the Uniformity Act (1662); for venturing to preach in his church (December 1662) he was cast into prison, but released by Charles II.

CALAMY, Edmund, English clergyman, grandson of the preceding: b. London, 5 April 1671; d. there, 3 June 1732. He was educated among the Dissenters and in Holland, and later became pastor of a congregation in Westminster and published an abridgment of Baxter's ‘History of His Life and Times,’ with a continuation; ‘Inspiration of the Scriptures’; ‘Life of Increase Mather’; ‘Historical Account of My Own Life’ (London 1830); and also carried on through the press controversies with Bishop Hoadly and others. He is well known for his ‘Nonconformists' Memorial’ (1778) which is the best historical source concerning the 2,000 ministers ejected from the Church of England by the Act of Conformity. Consult Palmer, ‘Abridgment of Nonconformists' Memorial’ (London 1802–03).

CALANCHA, ka-län'chạ, **Antonio de la,** Peruvian chronicler: b. Chuquisaca 1584; d. Lima, 1 March 1654. He belonged to the Augustinian order, and was rector of the College of San Ildefonso in Lima. Afterward he traveled extensively through Peru. He wrote ‘Crónica moralizada del Orden de S. Agustin en Peru,’ first printed at Barcelona in 1638 in folio, which is an important source for early Peruvian history. It was continued in a second volume, never completed, however, by Fray Diego de Cordova (Lima 1653). The first volume was translated into French as ‘Histoire de l'église du Perou aux antipodes’ (Toulouse 1653), and Brulius' ‘Historia Peruana’ (Antwerp 1651) is called a translation. The original work appeared at Barcelona 1639, under the title ‘Cronica moralizada del orden de San-Augustin en el Perú.’ The Spanish bibliographer Antonio credits Calancha with another work, ‘Crónica de los santuarios de Nuestra Señora de Copacabana y del Prado’ (Lima 1653).

CALANUS, Indian philosopher, much esteemed by Alexander the Great. At the age of 73, 323 B.C., being seized with illness at Persepolis, he caused a funeral pile to be erected, which he ascended with a composed countenance, and expired in the flames, saying, that having lost his health and seen Alexander, life had no more charms for him.

CALAS, kä-lạs, or kä-lạ, **Jean,** French judicial martyr: b. Languedoc 1698; d. Toulouse, 9 March 1762. Brought up in the Protestant religion, he had established himself as a merchant in Toulouse. He had four sons and two daughters whom he educated himself, and was held in general esteem, when he was suddenly accused of the crime of murdering one of his sons. In 1761 his eldest son, Marc Antonine, a young man of irregular habits and a gloomy disposition, was found strangled in his father's house. It was reported that the unfortunate youth had been put to death by his father because he wished to become a Catholic. Jean Calas and his whole family were arrested, and a prosecution instituted against him, in support of which numerous witnesses came forward. The Parliament of Toulouse condemned him, by eight voices against five, to be tortured and then broken on the wheel; and on 9 March 1762, the sentence was executed. He suffered the torture with firmness, and protested his innocence to the last. The youngest son was banished forever, but the mother and servant were acquitted. The family of the unhappy man retired to Geneva. Voltaire, then at Ferney, became acquainted with them, and for three years exerted himself to defend the memory of Calas, and to direct attention to the defects of the criminal law which affected profoundly the legal attitude toward the French Protestants. The widow and children of Calas also solicited a revision of the trial. Fifty judges once more examined the circumstances, and declared Calas altogether innocent, 9 March 1765. The King by his liberality sought to recompense the family for their undeserved losses, and people of the first rank emulated each other in endeavoring to relieve them. Consult Coquerel, ‘Jean Calas et sa Famille’ (Paris 1858); ‘Causes Célèbres’ (Vol. IV, 1875); Allier, Raoul, ‘Voltaire et Calas’ (Paris 1898); Masmonteil, ‘La legislation criminelle dans l'œuvre de Voltaire’ (Paris 1901); Fällentyre, ‘Life of Voltaire’ (2 vols., London 1903; New York 1905).

CALASIAO, kạ-lä-sẹ-ä'ō, Philippines, a town of the province of Pangasinan, situated in the western part of the island of Luzon, a few miles from the coast of the Gulf of Lingayen, on the main highway to Manila. Pop. (1903) 16,539.

CALATAFIMI, kä-lą-tä-fē'mē, Sicily, town in the western part of the island, in the district of Trapani, 57 miles southwest of Palermo. It is situated in a mountainous district, near the river Gaggera, is badly built, and has a ruinous castle on the summit of a neighboring hill, now used as a prison. The environs are well cultivated and extremely fertile. A ruined Saracenic castle stands above the town. In 1860 a battle took place here between Garibaldi's forces and Landi's Neapolitan troops, in which the latter were defeated. Pop. of commune (1910) 10,486.

CALATAGIRONE, käl-ä'tä-je-rō'nä, or **CALTAGIRONE** (ancient CALATA HIERONIS), Sicily, town in the province of, and 36 miles southwest of, Catania direct. It stands on two hills, 2,000 feet above sea-level, and consists generally of spacious, clean and well-built streets. There is a fine promenade and market-place, beside which stands the old castle. It is the see of a bishop, and has several churches and a college. Its inhabitants are highly skilled in the arts. It has a considerable commerce, and is celebrated for the manufacture of terra-cotta ware. It was fortified by the Saracens, and wrested from them by the Genoese. Roger Guiscard gave it important privileges. There are interesting Greek, Roman and Moorish remains. Pop. (1910) 43,169.

CALATAYUD, ką-lä-tą-yood', Spain, the second city of Aragon, 48 miles southwest of Saragossa. It stands on the Jalon, near its confluence with the Jiloca, at the foot of two rocky heights crowned with the ruins of Moorish forts. The upper or Moorish town is a very wretched place; but the modern town below is well built and contains many remarkable edifices, among which the most conspicuous are the church of Santa Maria, once a mosque, and surmounted by an octagonal tower; and that of San Sepulcro, a Doric structure containing many curious relics. Red wines are produced in the neighborhood, and about 10 miles from the town there are sulphur baths. The poet Martial was born at Bilbilis, a former town on the site of the present Bambola, two miles east of Calatayud. Pop. (1911) 11,594.

CALATRAVA, kä-la-trä'vą, **Order of**, a Spanish order of chivalry, originated during the Moorish wars. Calatrava la Vieja, taken from the Moors in the 12th century by the king of Castile, was committed to the Templars, who guarded it till 1158. At this time, a powerful army advancing to besiege it, they despaired of being able to defend it, and restored it to the king, who offered it in absolute property to whosoever would defend it. Two monks of the abbey of Citeaux (Cistercians), in France, presented themselves and were accepted. They preached a crusade, and offered a pardon of sins, and being supplied with money and arms, were able to repel the invaders. Thereupon, having received the investiture of the town and other donations, they instituted the same year (1158) an order into which all the nobility of Castile and Navarre were emulous to enter. In 1164 the chevaliers of this order, by sanction of Pope Alexander III, separated themselves from the monks, and the order became purely military. They still followed the rule of the Cistercians, until Paul III dispensed them from the vow of chastity. The almost uniform success of the Knights of Calatrava against the Moors gave rise to rashness, and in 1197 they were defeated and nearly exterminated, the survivors transferring the seat to the castle of Salvatierra. In 1523 the grand-mastership was transferred to the Crown by a papal bull, the knights being permitted to marry once by way of compensation for their loss of independence. Since 1808 the body has been continued as an order of merit.

CALATRAVA LA VIEJA, vē-ä'hą, a ruined city of Spain, situated on the Guadiana, about 12 miles northeast of Ciudad Real. It was captured by Alfonso VIII of Castile, who gave it to the Templars. They in turn, restored it to Sancho III (1157). Its defense against the Moors, undertaken by Raymond, abbot of Fitero, and Diego Velasquez in 1158, after it had been abandoned by the Templars, is famous on account of its having originated the Order of Calatrava (q.v.) in 1158.

CALAVERAS GROVE, the most northern of the California groves of big trees, containing about 100 of these trees. The tallest one standing is known as the «Keystone State,» and is 325 feet in height and 45 feet in girth; the «Mother of the Forest» is another tree of notable size, being 315 feet high and 61 feet in circumference. The grove is a State reservation.

CALAVERAS SKULL, a widely disputed fossil skull, now preserved in the Peabody Museum, Cambridge, Mass., reported by Prof. J. D. Whitney to have been found in 1886 in the undisturbed auriferous gravels of Calaveras County, Cal. Whitney assigned the skull to late Tertiary (Pliocene) times. The skull corresponds in type with those of modern Indian inhabitants of the district. Consult Hrdlička, 'Bureau of American Ethnology, Bulletin 33' (Washington, D. C., 1907).

CALAVERITE, a native gold telluride, $AuTe_2$, with the average composition: tellurium, 57.4 per cent; gold, 39.5 per cent; silver, 3.1 per cent. It was originally described by Genth as a very rare massive gold (and silver) telluride from Boulder County, Colo. It is the commonest of the gold ores of Cripple Creek and occurs there in beautiful triclinic crystals. It is found also in great abundance at Kalgoorlie, West Australia. Calaverite occurs with petzite at the Stanislaus mine, in Calaveras County, Cal., and with sylvanite at the Red Cloud mine in Boulder County, Colo. It is often confused with «sylvanite» by the miners, but while it is practically of the same qualitative composition as sylvanite, it carries a proportion of gold 25 to 40 per cent greater, and only about one-third as much silver. It has a brilliant metallic lustre, pale bronze-yellow color, a hardness of 2.5 and a specific gravity of about 9.

CALBAYOG, käl-bä'yōg, Philippines, town of Samar province at the mouth of the Calbayog River on the west coast, 30 miles northwest of Cathalogan. Hemp, the chief product, copra and fine timber are shipped to Manila. Pop. 16,000.

CALC-TUFA, a variety of calcite essentially travertine. It is formed in streams or springs by deposits of calcium carbonate in a cellular form. It often contains fossil twigs, moss, leaves, seeds, etc.

CALCAIRE GROSSIER, käl-căr grō-sē-ā, a coarse limestone of the Middle Eocene Tertiary series of the Paris and London basins. Its limestone strata furnish building material for the city of Paris. The fossils of the Calcaire Grossier are remarkable for number, and for the variety of forms, some 500 species in all being represented, including water shells as well as marine shells and rising up to the remains of the mammalia.

CALCAR, or **KALKAR, Jan Stephanus van,** yăn stĕ-făn'ŭs văn käl'kär, Dutch painter: b. Calcar in Westphalia 1510; d. Naples, 1546. He studied so thoroughly the style of Titian, that their pictures cannot always be distinguished. Later he imitated the style of Raphael with equal success. The 'Mater Dolorosa,' in the Boisserée collection in Stuttgart, a perfect work of art, is by him. Another small picture of his, the 'Infant Christ with the Shepherds,' was a favorite with Rubens. In this piece the light is represented as proceeding from the child. He designed almost all the portraits in Vasari's Lives, and the figures for the anatomical work of Vesalius.

CALCAREOUS, a term applied to substances partaking of the nature of lime or containing quantities of lime. Thus, we speak of calcareous waters, calcareous rocks, calcareous soils. Calcareous spar is calcite (q.v.).

CALCAREOUS TUFA. See CALC-TUFA.

CALCASIEU, käl'ka̜-shū, a river of Louisiana, rising in the western part of the State. It flows through the parish of the same name, and after a southerly course of about 200 miles enters the Gulf of Mexico through Lake Calcasieu. It drains a large area in southwest Louisiana, and is navigable by small boats for about 130 miles.

CALCEOLARIA (Latin, *calceolus,* a little shoe, alluding to the form of the corolla), a genus of plants of the family *Scrophulariaceæ,* mostly natives of South America, especially of Chile and Peru. They are characterized by having a corolla with a very short tube, with two lips, concave or shaped like a hood, the upper one very small, the under one greatly inflated. They are common as greenhouse or outdoor plants. There are about 200 species, of which about 20 are in cultivation, and their varieties are very numerous. The flowers of the indigenous species are white, yellow and purple. They are greatly excelled in beauty by the cultivated varieties, which acquire numerous tints in these colors, and have besides on the lower part of the corolla, the part which bears the strictest resemblance to a shoe, large spots, or innumerable small points of a different color, which have a very graceful effect. They grow best in a rich, open, sandy garden mold, and are propagated by seeds or cuttings, the herbaceous kinds mostly by the former method.

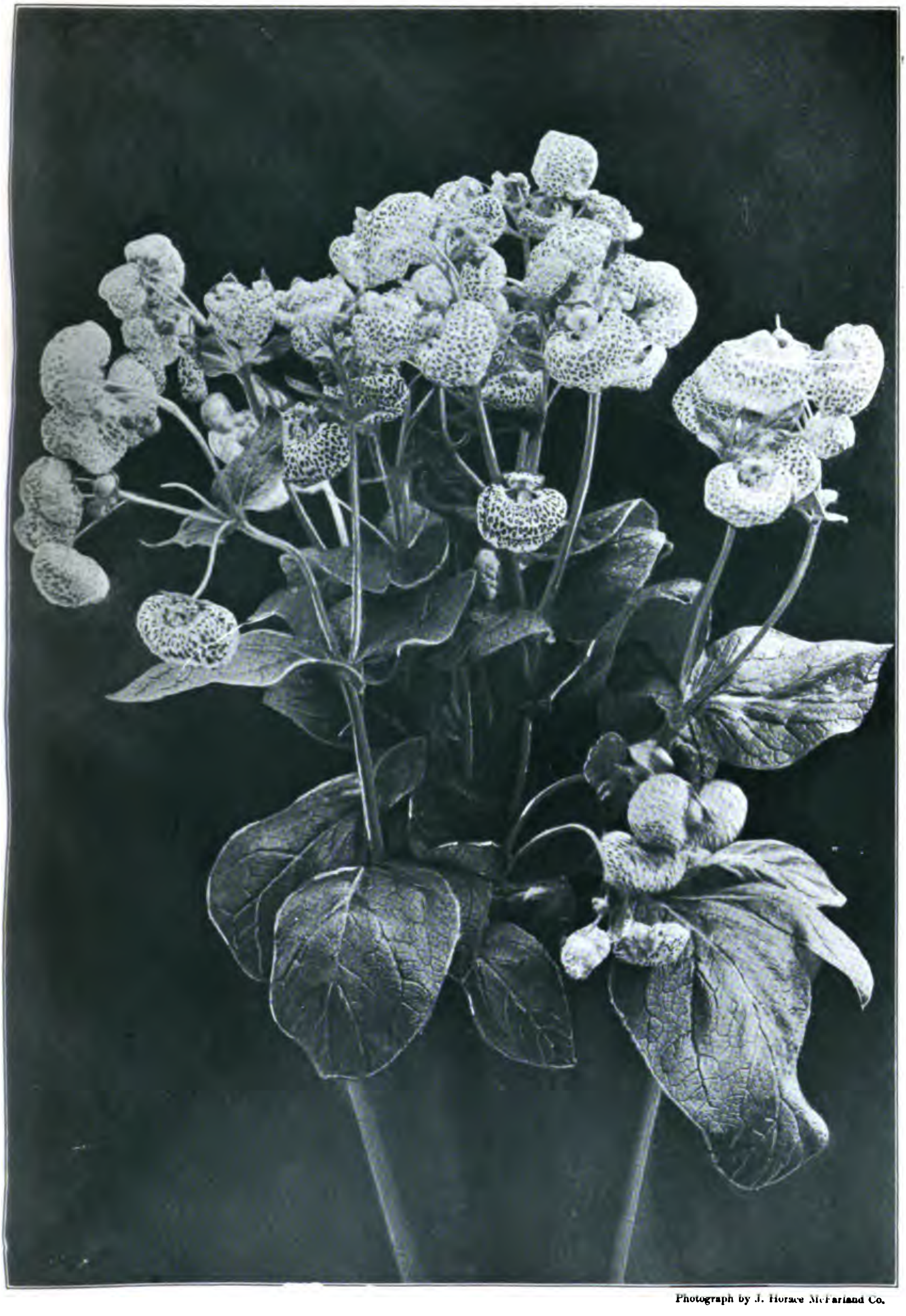
CALCHAQUI, ka̜l-chä'kē, a South American tribe formerly living in the northwestern part of Argentina. They were conquered by the Incas of the 15th century, and the ruins of their buildings and tombs indicate quite an advanced stage of civilization. They extended over considerable area of territory now belonging to Argentina. They lived in villages, as the surviving stone inclosures, mounds, cemeteries and art products show. They were visited by the Jesuit missionaries, but strongly opposed the inroads of the Spaniards. The tribe is now extinct and all record of their language is lost. Consult Chamberlain, A. F., in the *American Anthropologist* (N. S. Vol. XIV, pp. 503–07, 1912).

CALCHAS, kăl'kăs, a legendary priest and prophet of the Greeks at the time of the Trojan War, who foretold that Troy would not be subdued by them till the 10th year of the siege. At his advice, Iphigenia was sacrificed at Aulis to appease Artemis. He himself accompanied the Greek army to Troy. During the siege, the Greeks were attacked by a plague, and Calchas declared that it was the effect of Apollo's anger, because they had deprived his priest of his daughter Chryseis, whom Agamemnon had selected as his mistress. He counseled the Greeks to appease Apollo by restoring the damsel; and it was by his advice that they afterward built the wooden horse. There are various legends relating to his death. The most common is that he died of grief caused by his failure in a contest of prophecy with Mopsus at Colophon. At Apulia, where he had a temple and an oracle, his grave is shown.

CALCIFEROUS, a geologic term applied to the sandy limestones found in Pennsylvania, extending across New Jersey and New York to Canada, and known as the Beekmantown beds. The formation is probably the equivalent of the magnesium limestones of Iowa and Missouri and belongs to the Canadian epoch of the Lower Ordovician. See ORDOVICIAN.

CALCIMINE, a mixture of zinc-white, glue, water and pigments, used to finish the plaster walls of buildings. In cheaper forms, lithopone or Paris white is substituted for zinc-white. A superior dampproof form uses casein instead of glue. See WHITEWASH.

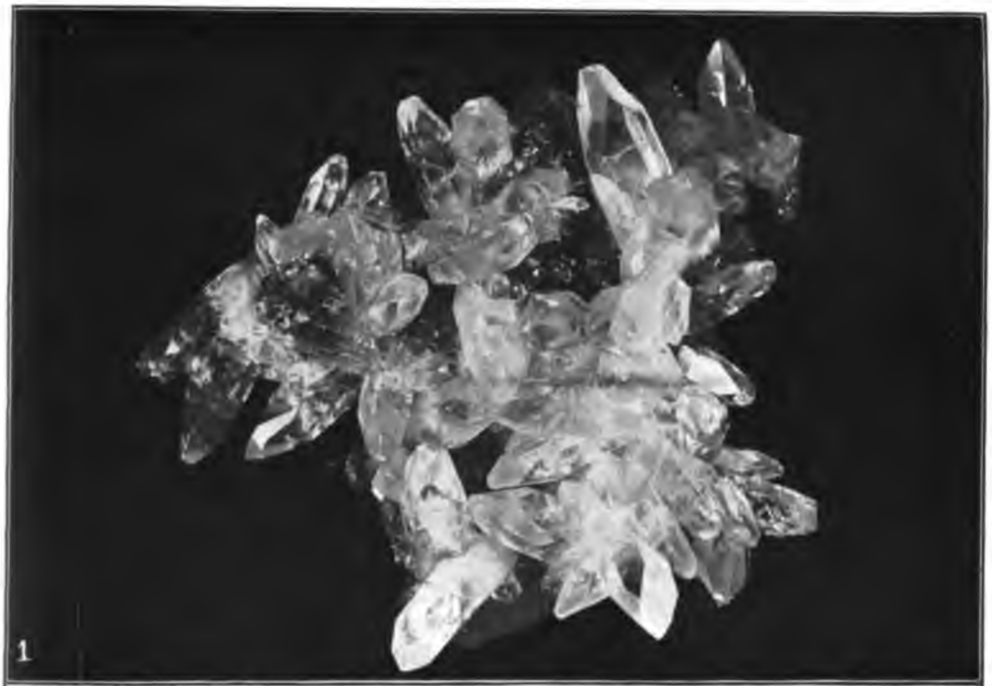
CALCINATION, a term now used as practically equivalent to roasting. It is derived from the Latin word *calx,* meaning quicklime, and received its present signification by extension from its original meaning of obtaining lime from limestone by the application of great heat. The process contemplates a very high degree of heat, but lower than the fusing point of the substance treated. By calcination many substances may be reduced to a friable condition, and freed from constituents capable of passing off in the form of gas or vapor. Thus various salts may be deprived of water of crystallization, and rendered amorphous in this way; the hydrated carbonate of magnesium is reduced to the pure oxide, known as calcined magnesia; limestone is converted into quicklime, etc. Calcination is usually the first process in the extraction of metals from their ores. The oxides of metals produced by this process were formerly known as calxes, but this term is now disused. It depends on circumstances which oxide is obtained, if the metal, like lead, can form more than one. The weight of the total calx is equal of course to that of the metal and the oxygen with which

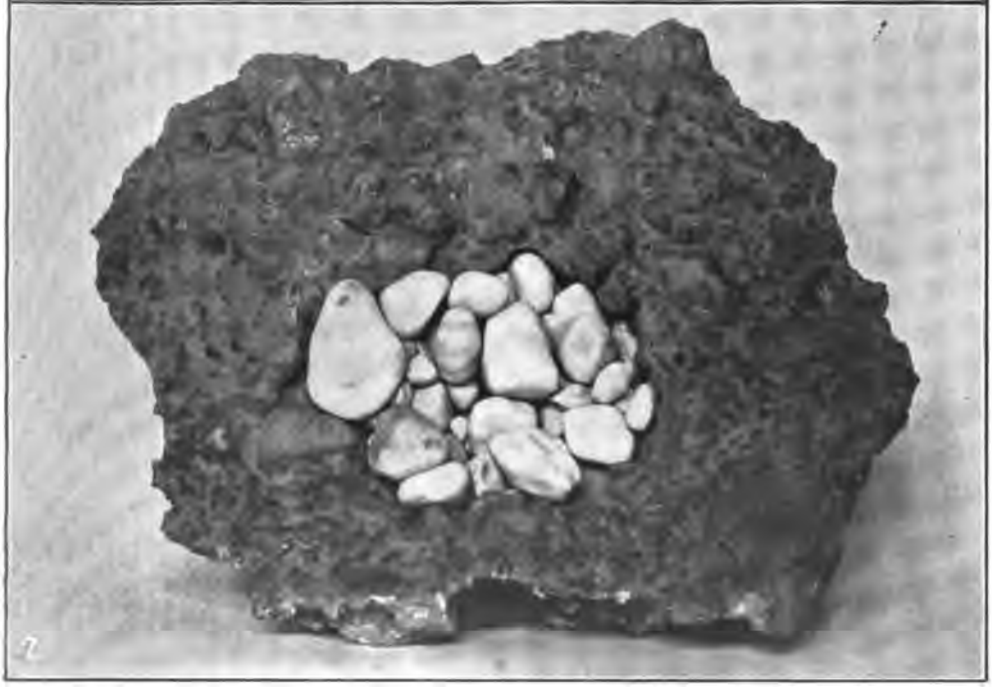


Photograph by J. Horace McFarland Co.

CALCEOLARIA (FISHERMAN'S BASKET)

CALCITE





1 Calcite Crystals, Bigrigg Mine, England **2 Calcite "Bird's Nest," Reichelsdorf, Hesse, Germany**

it has combined, but the calx itself is specifically lighter than the metal. Platinum, gold, silver and some other metals are not affected in this way, and on this account they are called the noble metals. See COMBUSTION.

CALCITE, -sīt, also known as calc-spar, a native carbonate of calcium, crystallizing in the rhombohedral system, and exhibiting over 300 distinct crystals of general forms or "habits." The mineral also occurs massive, fibrous, granular, lamellar, compact, earthy, stalactitic, nodular. In other forms it exhibits minute percentages of magnesium, iron, manganese, zinc and lead, replacing equivalents of calcium. Its typical crystals exhibit a very perfect cleavage, commonly splitting up, from a blow, into many small rhombohedrons. Pure crystals have the composition carbon dioxide 44 per cent, lime 56 per cent. They show a vitreous or earthy lustre and have a specific gravity of about 2.72, and a hardness of about 3, though the latter varies somewhat with the face of the crystal. Calcite may be transparent, translucent or opaque, and in color may vary from white, or colorless, to black, also brown, violet, blue, green, yellow and red. It exhibits the phenomenon of double refraction powerfully, and transparent crystals of it (called "Iceland spar" because first obtained from Iceland) are used in the manufacture of polarizing prisms. (See LIGHT). Limestone, marble and chalk are commonly classed as massive or cryptocrystalline varieties of calcite. Oolite (q.v.) is a granular limestone composed of innumerable minute rounded concretions. Pisolite is a similar variety in which the spheres are as large as peas. The stalactites and stalagmites of many caves (q.v.) are calcite. Mexican onyx, travertine and calc-tufa (q.v.) are a few of the many other varieties of calcite. Varieties containing other metallic carbonates are known as baricalcite, strontianocalcite, ferrocalcite, etc. Calcite effervesces briskly even in cold acid. It occurs abundantly all over the world; especially choice specimens of crystals come from Germany, England, Guanajuato, Mexico; Rossie, N. Y.; Joplin, Mo., and Lake Superior. Examples of the stalactite forms are found in caves at Schoharie, N. Y., and at Wier's Cave in Virginia. The various rock forms of calcite are burned to make lime, and also in mixture with silica and alumina in the manufacture of Portland cement. See CALCIUM; CEMENT.

CALCITE GROUP, in mineralogy, an important series of rhombohedral carbonates of the bivalent metals — calcium, magnesium, iron, manganese, zinc and cobalt. The series includes calcite, $CaCO_3$; dolomite, $(Ca, Mg) CO_3$; ankerite, $CaCO_3 (Mg, Fe, Mn) CO_3$; magnesite, $MgCO_3$; mesitite, $2MgCO_3.FeCO_3$; siderite, $FeCO_3$; rhodochrosite, $MnCO_3$; smithsonite, $ZnCO_3$; and sphærocobaltite, $CoCO_3$.

CALCIUM, a metallic element first obtained in the free state by Sir Humphry Davy in 1808. Its compounds are exceedingly abundant and are widely distributed. Calcium carbonate, $CaCO_3$, is familiar in its various forms of marble, chalk, limestone and calcite. The sulphate, $CaSO_4$, is also very common, and is perhaps best known in the form of gypsum, which contains two molecules of water, and therefore has the formula $CaSO_4 + 2H_2O$. Calcium phosphate also occurs in nature in considerable quantities, both in the form of fossilized bones and as a constituent of apatite (q.v.) and its various modifications.

Metallic calcium may be obtained by the electrolysis of the fused chloride (which melts at a red heat), or by decomposing the iodide with metallic sodium. It is a white metal with a light yellow hue, has a hardness about equal to that of gold and is very malleable and ductile. Its density is 1.548 and its melting point about 1455° F. Its chemical symbol is Ca, its specific gravity is about 1.58 and its atomic weight is 40.0 $(O = 16)$. Perfectly dry air does not affect it at ordinary temperatures, but in moist air it becomes rapidly coated with the hydrate $Ca(OH)_2$. When strongly heated in air it burns with a yellow flame, taking up oxygen to form the oxide CaO. It decomposes water rapidly, passing into the form of the hydrate, with evolution of hydrogen. It melts at a red heat, has a specific heat of about 0.169 and has an electrical resistance only about one-twelfth of that of mercury.

In its chemical relations calcium is a dyad. It combines with almost every known acid, and yields a vast number of compounds, many of which are of great industrial value. Of these the best known are the carbonate, oxide, hydrate, chloride, sulphate, phosphate, fluoride, carbide and bisulphide, and the indefinite mixture of the chloride and hypochlorite known as bleaching-powder (q.v.).

The carbonate occurs native in large quantities, as already noted. It is also commonly present in ground water as obtained from wells and springs. It is almost insoluble in pure water, but dissolves to a considerable extent when the water contains free carbon dioxide in solution. It is this compound that gives to water what is known as "temporary hardness." Upon boiling, the free carbon dioxide held in solution is expelled, and the lime carbonate is therefore precipitated also, so that the water loses that part of its hardness which is due to the presence of the carbonate. This effect is well illustrated, in regions where the soil is rich in limestone, by the crust of lime carbonate that is deposited upon the interior of household kettles that are used for heating water. Calcium carbonate also gives rise, in steam boilers, to troublesome deposits that keep the water out of contact with the metal plates, which, in such cases, become overheated and seriously impaired in consequence. To prevent this action chemists often recommend the addition to the water in the boiler of a certain amount of ammonium chloride (sal ammoniac). This compound combines with the lime carbonate to form calcium chloride, which is exceedingly soluble, and ammonium carbonate, which is volatile, and therefore passes away with the steam. Beautiful as this process is in theory, it cannot be recommended for adoption in practice, because if the sal ammoniac is present in any excess it induces rapid corrosion of the boiler plates.

When calcium carbonate (more familiarly known as carbonate of lime) is strongly heated in a current of air, it loses its carbon dioxide and becomes converted into a substance known to the chemist as calcium oxide CaO, and in the arts as quicklime, burnt lime or simply lime. Pure calcium oxide (or lime) is a white, amorphous substance, infusible, glowing with a dazzling white light when strongly heated, possessing caustic properties and acting as a powerful chemical base. When treated with about one-third of its own weight of water, lime passes into the form of the hydrate or hydroxide, $Ca(OH)_2$, with the evolution of much heat. The process of converting it into the hydrate by the addition of water is called slaking, and the resulting hydrate is known in the arts as slaked lime. Mortar is composed of a mixture of slaked lime and sand, the silica (or sand) slowly combining with the lime to form a silicate after the mortar has been applied. Slaked lime, or calcium hydrate, is somewhat soluble in water, its solution being known as lime water.

Calcium chloride is formed when calcium carbonate is dissolved in hydrochloric acid. It is exceedingly soluble, but upon evaporation of its solution it separates in white, needle-like crystals having the formula $CaCl_2 + 6H_2O$. When these are heated to about 400° F. they lose two-thirds of their water of crystallization and become converted into $CaCl_2 + 2H_2O$, in which form the chloride is commonly used. Thus prepared, calcium chloride is a white, porous solid, which absorbs moisture with great avidity, and hence is exceedingly valuable to the chemist and physicist for drying air and other gaseous bodies. It forms crystalline compounds with ethyl and methyl alcohols, which are again resolved, by the addition of water, into calcium chloride and the free alcohol. On account of this property it has been used for the preparation of these alcohols in the pure state. See also CALCIUM CHLORIDE.

Calcium hyperchlorite is a bleaching agent which is more stable than ordinary bleaching powder (chloride of lime), yielding a clear solution in water and containing from 80 to 90 per cent of available chlorine. (See BLEACHING). It is made by passing chlorine gas into milk of lime at a temperature not exceeding 90° F., and then concentrating the solution to crystallization. Besides its bleaching properties it is used in very large quantities for the purification of water in reservoirs for drinking purposes.

Calcium sulphate occurs native in the anhydrous form, as the mineral anhydrite; and, combined with two molecules of water, it also occurs abundantly as gypsum. It is soluble in 400 parts of water, and, like the carbonate, it occurs quite generally in the waters of wells and springs. Like the carbonate, too, it makes the water in which it occurs hard; but the hardness due to the presence of the sulphate cannot be removed by boiling, and it is therefore said to be "permanent." Calcium sulphate produces deposits in steam boilers that are far more troublesome and injurious than those due to the carbonate, since the sulphate is deposited in a hard, compact, stony form, and can be removed only with difficulty.

When gypsum is moderately heated it loses its water of crystallization and becomes converted into a substance that is commercially known as plaster of Paris, from the fact that the gypsum from which it is prepared (and which is also called plaster of Paris, though rarely) occurs abundantly in the Tertiary formations of the Paris basin. Plaster of Paris, when moistened by the addition of the proper quantity of water, takes up two molecules of water again, and rapidly sets into a hard, solid mass which expands somewhat at the instant of solidification. It is much used in making casts and molds. These are harder and better when the plaster is wetted with a solution of alum than they are when pure water is used for this purpose. If equal weights of the anhydrous sulphates of calcium and of potassium are wetted with about four parts of water, the mixture sets like plaster of Paris, with the formation of a double sulphate of calcium and potassium, having the formula $CaSO_4.K_2SO_4.H_2O$. The casts so obtained exhibit polished surfaces, superior to those obtained with pure plaster.

Calcium fluoride, CaF_2, occurs native as fluorspar, or fluorite, and is used to some extent as a flux in metallurgical operations, to which circumstance it owes its name (Latin *fluor*, a flux). It is also used in the manufacture of vases and other ornamental articles and as a source of hydrofluoric acid, which is set free when the fluoride is treated with warm sulphuric acid.

Calcium carbide, CaC_2, has long been known, and was prepared by Wöhler in 1862 by melting an alloy of zinc and calcium in the presence of carbon. Its commercial importance, however, dates from the discovery made by Mr. T. L. Willson in 1892, that it can be formed by the direct combination of lime and carbon at the temperature of the electric furnace. Large quantities of it are now made by this process at Niagara Falls, at Spray, N. C., and elsewhere. Calcium carbide in its commercial form is a dark-gray substance, often almost black. It is hard, infusible and incombustible, with a specific gravity of about 2.24. Its value in the arts depends upon the fact that when it is thrown into water a double decomposition occurs, by which acetylene gas is formed, in accordance with the equation $CaC_2 + 2H_2O = C_2H_2 + Ca(OH)_2$. See ACETYLENE; CARBIDE.

Calcium phosphide, Ca_3P_2, has the property of decomposing instantly when thrown into water with the evolution of phosphuretted hydrogen which takes fire spontaneously. It is used in several forms of marine signal lights and also in naval target practice at night.

Calcium sulphite, $CaSO_3$, is formed and precipitated as a white powder when a solution of a calcium salt is added to a solution of an alkaline sulphite. The sulphite so formed requires 800 parts of pure water to effect its solution. It is far more soluble in sulphurous acid, however, and it is believed that the sulphurous acid acts upon it to produce a new but comparatively unstable compound, $CaSO_3.SO_2$, to which hypothetical substance the name calcium bisulphite, or bisulphite of lime, has been given. Upon exposure to air the bisulphite solution gradually deposits crystals of the monosulphite, having the composition $CaSO_3.2H_2O$. On the commercial scale the bisulphite solution is prepared by passing sulphur dioxide gas (SO_2) through "milk of lime" (that is, water containing slaked lime in suspension). The monosulphite of lime is first formed, and by the continued action of the sulphur dioxide this passes into solution in the form of the bisulphite. The usefulness of bisulphite of lime in the arts depends upon the power of dissolving the gums and resins by which the fibres of wood are cemented together. Thus, in the sulphite process of manufacturing wood pulp, chips of wood are submerged in a solution of the bisulphite and heated for some hours in closed digesters, by the action of steam. By this means the chips are disintegrated, the gummy connective materials being entirely dissolved away, and the wood being thereby reduced to a mass of separate fibres, which after simple washing and bleaching are ready for use in the manufacture of paper. See ELECTROCHEMICAL INDUSTRIES.

CALCIUM CARBIDE. A compound crystalline substance composed of calcium and carbon. Its symbol is CaC_2. When pure it is colorless and transparent, but as found in commerce it is of a lustrous reddish-brown or blackish color, being discolored by iron. It is a substance of great economic importance, owing to the fact that it decomposes with water at ordinary temperatures, with the formation of acetylene gas. See CALCIUM; CARBIDE; ELECTROCHEMICAL INDUSTRIES.

CALCIUM CHLORIDE. The commercial supply of this important chemical salt is obtained from natural brines found in several localities in Michigan, Ohio and West Virginia. The output in 1916 was 26,062 tons (20,535 tons in 1915), valued at $216,729. In addition to this direct and recorded production there were thousands of tons produced as a by-product in the manufacture of soda. The uses of calcium chloride are constantly increasing in number. One of the most important is that the addition of 3 per cent to Portland cement permits cement work to be carried on during freezing weather. In the water-jackets of water-cooled automobile engines a 20-per cent solution of calcium chloride will remain liquid down to a temperature of 9 degrees below zero. In refrigerating apparatus it is much superior to common salt (sodium chloride), remaining liquid at a much lower temperature. Because of its affinity for moisture it is used to sprinkle roads, tennis courts and playgrounds, to prevent dust. It is used also to preserve railroad ties and fence posts, and other timber used under similar conditions, and also in the manufacture of important dyestuffs. See also CALCIUM.

CALCIUM LIGHT, a brilliant light produced by directing the flame of an oxy-hydrogen blowpipe against a block of compressed quicklime. It had long been known that lime emits a light of extraordinary brilliance and whiteness when strongly heated in this manner, but the first practical application of the principle was made by Capt. Thomas Drummond in 1825, in connection with the trigonometrical survey of Ireland. The calcium light is constantly employed in the production of theatrical effects and for the projection with a stereopticon of photographic pictures upon a screen. It is also called Drummond light, lime-light and oxy-hydrogen light.

CALCULATING MACHINES. These machines are classified according to their use, as arithmetical or geometrical; the former dealing with computations of numbers, the latter with calculations of lengths, areas or contents. In the first class the operations performed by the machine may be simply addition, in which case it is called an adding machine. Some of these simple machines also perform subtraction. The multiplying machines are far more complicated and perform also division, and they can be manipulated so as to work problems in the rule of three, and extract square roots.

In the simple adding machine the number is always progressively added, a unit at a time. Several different devices have been employed by inventors to accomplish this result. The simplest is a train of wheels bearing the nine digits and zero on the face of the wheel near its outer edge. On the first wheel (at the left) units are counted up to 10. At the tenth count the next wheel to the left is moved one cog by a stud which operates each time the «units» wheel makes a complete revolution. The «hundreds» wheel, next again to the left, is in like manner turned one cog when the «tens» wheel completes one revolution; and so on. The result is read through a «window» showing the uppermost figure on each wheel. On this principle the automobile speedometer and the trolley-car fare indicator are operated. Other devices include a rocking sector of a circle, operated by a key. On the curve of the sector are nine teeth engaging a counting wheel with nine teeth. When the key marked 9 is depressed, the entire sector moves in gear with the counting wheel giving it a complete turn. When the key 4 is depressed only four of the teeth engage the wheel which is thus turned only four-ninths of a complete revolution. A second sector placed to the left of the first and operated in the same way would count tens, and a third sector still farther to the left would count hundreds; and so on up to as many places as desired. Several variations of this system have been utilized. The key may not move the sector when it is pressed, it may simply set a stop or check, and the movement may be produced by a lever, or by electric mechanism. This is the device used in the cash register, and in the Burroughs Adding Machine.

Another application of the same fundamental idea is the stepped cylinder, in which ridges running lengthwise of the cylinder take the place of cogs on a wheel or sector. These ridges are of different lengths, appearing as steps, each succeeding ridge being longer by one unit than the ridge preceding. By sliding a toothed counting-wheel across the cylinder, a distance regulated by the position of the desired number on a scale, and turning the cylinder by a crank, the respective number of ridges at that plane will operate the counting-wheel. This device is utilized in the Arithmometer and other machines of the Thomas type. A variation of this idea consists of a series of racks in place of the ridges on the cylinder — as in the Mercedes machine.

Another basic device is a cylinder having cogs which may be withdrawn into the body of the cylinder by adjusting a cam-shaped ring. The teeth or cogs which remain projecting beyond the surface of the cylinder are those which operate the counting wheel. The action may be similar to that of the sector, the teeth operating in one plane, or it may follow the plan of the stepped cylinder, and the teeth be «stepped» and operate on a sliding carriage. This device is used on the Brunsviga machine, and the many modifications of it. Adding machine attachments have been devised for type-writers, whereby figures set in a column by the typewriter are added by the attachment and the total may be printed in at the foot of the column.

The Abacus, described elsewhere in this encyclopædia, in one of its varied forms is widely employed in India, China and Japan for making a variety of mathematical calculations, generally for commercial accounting.

In the geometrical class of calculating machines the simplest type is a measuring wheel which is graduated on its circumference, and is run over the lines to be measured, a recording mechanism at the axis showing the total distance traversed. The slide rule is a device of some little antiquity, having been invented in the logarithmic type in 1620 by Gunter. Many other mathematicians followed with variations and adaptations. The slide rules are classified as (1) those working with movable indexes, and (2) those with adjacent sliding scales. To the first class belong the circular scales of Oughtred, Scott, Nicholson and Weiss; and the spiral scales of Milburne, Adams, Nicholson and Lilly. To the second class belong the straight rules of Partridge, Everard, Roget and Mannheim; the circular rules of Biler, Sonne and Charpentier; and the cylindrical rule of Thacher. The standard British slide rule is of the Mannheim type, and carries four scales, two on the stock and two on the slide. The slide is set for the problem in hand, and the result is read by a «runner,» or the rule may be turned over and read from scales on the back. The Integraph is a mechanical apparatus for solving graphically differential equations. Planimeters are machines which measure lines and the areas of plane surfaces. There are several types, but only one, the polar planimeter, is in use at the present day. There are two separate fixed points on this machine, one of which is the pole. From these points reach out arms to a carriage on which is a tracing wheel and calculating mechanism mounted on a sleeve, which slides along graduations on one of the arms. A modification of this machine has a long straight rail against which a guide is held while the machine is being operated. The Integrator is another form of planimeter by which many intricate problems may be solved mechanically. The name «Harmonic Analyser» is given to another machine of similar construction. The «Tide Predicters» of Roberts and Lord Kelvin are among the remarkable mechanisms devised to solve mathematical problems. With these machines set with a duplication of the component forces operating upon the tide at any port, the mechanism delivers in about two hours a tracing showing graphically the movements of the tide at that port for a year in advance.

The Hollerith electric tabulating mechanism used by the United States Census Bureau is prominent among the remarkable calculating machines that have been developed in America. Three separate machines constitute the outfit. The first one punches holes in cards, in any one or more of 240 places; the second tabulates the cards, while the third sorts them. Machine No. 1 has a keyboard of 240 keys, this being the number of answers called for in the census blanks of the bureau. The operator takes a return blank, representing the report of some individual, and, as he reads it, strikes the appropriate keys, which results in the punching of a card, that becomes a mechanical counterpart of the original return. As the average number of questions answered on each return is but 15, the work is not so tedious as might be inferred from the statement as to 240 questions.

When the cards of a State have been punched, they are brought to the tabulating machine, which is the real calculator. This machine reads the holes of the cards that are fed into it, and makes an electrical record of each hole, according to its position, adding up the totals for each hole, and showing them on dials. When the cards are all fed through, the total of each of the 240 replies is enumerated. The third machine is a sorting box, which serves to secure answers to cross-questions. For instance, if it is desired to know how many white persons are among the total number convicted of crime, the sorting box will locate all cards having the holes corresponding to these two statements, and give the total. In this way a great variety of statistics are made available which it would be too expensive to gather or compute in any other way. For other information on this subject, see CASH REGISTER; COMPUTING SCALE. Consult Cajori, F., ‘A History of the Logarithmic Slide Rule’ (London 1909); Horsburgh, E. M., ‘Modern Instruments and Methods of Calculation’ (London 1914); Pickworth, C. N., ‘The Slide Rule: A Practical Manual’ (London 1910).

CALCULUS. As used in medicine the term calculus (Lat. *calculus*, a pebble or small stone) is applied to certain concretions occurring in the cavities or tissues of the body, usually as the result of the deposition of solids from some natural secretion. Calculi may be of many different sorts, and vary greatly in consistency, some being merely crumbly masses that can be crushed between the fingers, while others are extremely hard. Calculi occurring in the lachrymal or tear passages are called dacryoliths, while salivary calculi are formed in the salivary glands or their ducts, and amygdoliths in the tonsils. So-called rhinoliths are concretions which sometimes develop in the nasal cavities, usually as the result of the presence of some foreign body. The tartar on the teeth is sometimes spoken of as dental calculus. Pneumoliths occur in the lung and broncholiths in the bronchi; pancreatic calculi are found in the pancreas. The breast and prostate gland also occasionally harbor calcareous concretions, which in the former case are called lacteal calculi. The deposits of chalk about the joints in gouty persons are sometimes referred to as arthritic calculi. Intestinal calculi or enteroliths may give rise to serious disturbances, and if they happen to occur in the vermiform appendix often simulate date or other fruit stones in appearance. Before appendicitis was well understood their true nature often passed unrecognized and when they were discovered in cases of the disease the malady was mistakenly attributed to the swallowing of such foreign bodies. The two most important types of calculi, however, are the biliary calculi or gallstones, and urinary calculi.

Gall-stones are very common and fortunately usually do not give rise to symptoms. It is estimated that in Europe 10 per cent of the entire population have gall-stones, while in this country their frequency is held to be about 7 per cent. As their formation is probably encouraged by sedentary life and conditions favoring stagnation of the bile, such as tight lacing, lack of exercise and constipation, they are three times commoner in women than in men. They rarely give symptoms in younger persons, and about half of the patients are over 40 years of age. Pregnancy is said to be of importance in favoring their formation. Biliary calculi may be extremely small or may attain considerable size, stones as large as an English walnut not being at all uncommon. They also vary greatly in number and the smaller ones may be present in hundreds. They are composed principally of cholesterin (q.v.), with varying but much smaller amounts of bile pigment, lime and magnesium salts, fatty acids and bile acids. It is now generally assumed that an inflammatory or catarrhal condition of the mucous membrance of the gall-bladder (q.v.), usually induced by micro-organisms, furnishes the starting point of gall-stone formation. As already stated gall-stones may remain in the gall-bladder for years without causing symptoms, or their presence may be accompanied by inflammatory changes in the organ, or they may enter the gall-ducts and give rise to disturbances of various sorts, of which pain, local tenderness, persistent or remittent jaundice, clay-colored stools and chills and fever are conspicuous features. While a rational and hygienic mode of life will do much to prevent the formation of gall-stones, if they are present and give rise to symptoms that are at all severe surgical intervention is usually necessary to effect a cure.

Urinary calculi may be found either in the kidney, ureter or bladder, and are accordingly called renal, ureteral or vesical calculi. Kidney stones of small size often pass into the ureter and during their journey downward to the bladder give rise to seizures of renal colic which in the agony and general prostration they cause are very similar to those of biliary colic. The pain is felt lower down in the abdomen and also in the back; frequently also radiating along the inner surface of the thigh. Aside from the attacks of colic renal stones may cause pain in the back, chills, fever and bloody or turbid urine containing pus. «Coral calculi» are large stones which gradually fill the pelvis of the kidney, and in the conformation reproduce with great fidelity the irregularities and recesses of this cavity. Very small concretions pass into the bladder without difficulty and are evacuated in the urine as «gravel.» Stone in the bladder is rare in women and in the male sex is seen oftenest in infancy and after the fiftieth year. The symptoms include pain increased by jolting or bodily motion, frequent urination, pain at the end of urination — and sometimes sudden stoppage of the stream owing to the fact that the stone rolls into the neck of the bladder shutting off the flow — and usually bloody and turbid urine. Stone is especially common in old persons on account of the cystitis (q.v.) often present. Urinary calculi may be composed of various materials, of which uric acid and urates, calcium oxalate («mulberry calculus»), calcium phosphate and ammonio-magnesium phosphate are the commonest, singly or in combination. Rarer forms are made up of calcium carbonate, cystin or xanthin. The cut section usually shows a laminated structure and a nucleus or starting point, which may be a blood clot, a shred of tissue, a bit of mucus, a small renal calculus, a mass of urates or a foreign body. Any conditions encouraging excessive deposition of the urinary constituents predispose to urinary calculi. Among such causes are lack of exercise, digestive disorders, defective oxidation, excesses in eating or drinking, catarrhal conditions of the urinary tract, etc. The tendency to stone formation is particularly pronounced in those having what is called the gouty or lithemic diathesis. The diagnosis of renal calculi is facilitated by the use of the X-ray, while for the detection of bladder stones a special form of steel sound termed a «stone searcher» is introduced into the bladder. The cystoscope is also of great service in this field. Individuals predisposed to stone should keep the urine abundant by the free use of water — preferably distilled — and milk, should take much open-air exercise and avoid the consumption of large amounts of meat, fats, sugar or alcohol. Green vegetables, salads, bread, poultry, fish, eggs and fruit should form the main articles of diet. Despite the claims of nostrum venders, when a stone is once formed there is little chance of its being dissolved by any plan of internal medication. If the condition causes decided symptoms surgical removal of the offending body is indicated. See LITHOTOMY; LITHOTRITY.

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CALCULUS, The Infinitesimal. The Infinitesimal, or Differential and Integral, Calculus is not so much a branch of mathematics as a method or instrument of mathematical investigation, of indefinite applicability. The masters now seldom try to treat it in less than a thousand large pages; here we may hope no more than to expose its basic principles, to illustrate its characteristic processes and to exhibit some of its more immediate applications, with their results. Even so little will require the utmost condensation and self-explaining abbreviations.

We might define the Calculus as the Theory and Application of Limits, so central and dominant is this latter concept. We must, then, clear the ground for its full presentment.

Successive addition of the unit 1, continued without end, gives rise to the *Assemblage* of positive integers, in which all additions, multiplications and involutions are possible. This assemblage is *ordered:* i.e., of two different elements, a and b, either $a<b$ or $a>b$; and if $a<b$ and $b<c$, then $a<c$. To make all subtractions (inverses of addition) possible, we annex the symmetric assemblage of *negative* integers, any negative integer as a' (or $-a$), being *defined* by the equation $a+a'=0$, this 0 itself being defined by $a-a=0$. To make all divisions (inverses of multiplication) possible, we annex the assemblage of *Fractions,* quotients of integers by integers. This total assemblage of integers and their quotients, both + and —, we may call the *domain* or assemblage of *rational real* numbers, wherein all direct operations (of addition and multiplication) and also the inverses (subtraction and division) are possible.

For a precise definition of the processes of annexation here involved, see ALGEBRA, DEFINITIONS AND FUNDAMENTAL CONCEPTS.

The operation of involution is direct, a special case of multiplication, but is not commutative like addition and multiplication: thus $a+b=b+a$, $ab=ba$, but in general $a^b \neq b^a$. Hence the direct operation a^b, yielding c, has two inverses: Given b and c, to find a, and given a and c, to find b. The former gives rise to roots or surds, the latter to logarithms. But neither of these can in general be found in the universe of rationals; to make such inversions always possible, we must still further enlarge the domain of number by annexing *Irrationals*. These demand exact definition.

Divide the assemblage of rationals into two classes, A and B, any member a of the first being $<$ any member b of the second. Three possibilities present themselves:

1. A may contain and be closed by a number $\alpha >$ any other a but $<$ any b.
2. B may contain and be closed by a number $\beta <$ any other b but $>$ any a.
3. Neither A may contain a largest a, nor B a smallest b. Thus we may form (1) A of 2 and all rationals < 2; or (2) B of 2 and all rationals > 2, — in either case 2 is a *border* (frontière) number; or (3) A of all negatives and all positive rationals whose squares are $<$ 2 and B of all positive rationals whose squares are > 2. Here there is *no border number* among rationals. But a border does exist, *defined* as $>$ any a but $<$ any b. We name it *second root* of 2 and denote it by $\sqrt{2}$ or $2^{\frac{1}{2}}$. All such common borders are called *Irrationals*. The assemblage of irrationals is determined by all such possible partitions of rationals (A, B). The assemblage of all rationals and all such irrationals is the assemblage of Reals. It remains and is possible to extend the operations of arithmetic to all reals. In particular, the assemblage of rationals is *dense*; i.e., between every two there is an infinity of others; in the same sense the assemblage of reals also has density. Again, always on dividing all reals into A and B, in such a manner that each member of $A <$ each member of B, there will be a border γ, the greatest in A or the least in B, all less numbers being in A, all greater in B. Hence, and in this sense, the assemblage of reals is named *continuous*.

In this continuum, admitting no further introductions, suppose a magnitude to assume successively an infinity of values: $v_1, v_2, \ldots v_n, \ldots V_{n+k}, \ldots$; it is then called a *variable*, V, and its values in order form a *sequence*, S. It often happens that V will approach some *constant* L, so that by enlarging n we may make and keep the modulus or absolute worth (i.e., regardless of sign) of the difference $V-L <$ *any preassigned positive magnitude*, ε, for all following values of V; in symbols, $|V_{n+k}-L| < \varepsilon$ for every positive k. Then L is called the *Limit* of V: $L = Lim.\ V$. Plainly, V cannot have two limits as thus defined. It is easily seen that V will have a limit when and only when $|V_{n+k}-V_n| < \varepsilon_n$. If V changes always in the same sense, by increase or decrease, it has a limit when and only when $|V| <$ always than some fixed number n. When V increases (positively or negatively) beyond any assignable n, it is often said to have ∞ as limit.

A perfect *geometric illustration* is found in the sequences I and C of inscribed and circumscribed regular polygons of the circle. Here every C is $>$ every I; also $C_n - I_n < \varepsilon$; also $C_{n+k} - C_n < \varepsilon$, $I_{n+k} - I_n < \varepsilon$, $C_n - A > \varepsilon$, $A - I_n < \varepsilon$ (A being the circle-area); hence A is the common *limit* both of C_n and of I_n, for n *increasing without limit* ($n \doteq \infty$).

Algebraically, if $C_1, C_3, C_5 \ldots C_{2n+1} \ldots$ be the sequence (O) of odd convergents and C_2, $C_4, \ldots C_{2n} \ldots$ the sequence (E) of even convergents in an interminate continued fraction as $\frac{1}{1+1}+\frac{1}{1+1}+\frac{1}{6+1}+\frac{1}{} \ldots$ then every $C_{2n+1} > C_{2n}$, also $C_{2n+1} - C_{2(n+k)+1} < \varepsilon$, $C_{2n} - C_{2(n+k)} < \varepsilon$; and $C_{2n+1} - (\sqrt{13}-3) < \varepsilon$, $(\sqrt{13}-3) - C_{2n} < \varepsilon$. The odd convergents from above and the even convergents from below close down endlessly upon their *common limit*, $\sqrt{13}-3$, — as quadrants of an hyperbola and its conjugate close down upon their common asymptote.

The difference $|V-L|$ is a *variable small at will* and is called *Infinitesimal* (σ); its *limit* is 0. The quotient of two σ's will generally be a variable; if it has a finite limit L, the σ's are named *of the same order;* if the limit of the quotient is 0 (or ∞), then the numerator (or denominator) is of *higher* order. If any σ be chosen as standard, it is called *principal* infinitesimal; any other whose pth root is of the same order as the principal σ is itself said to be of pth order.

Easy theorems are now proved as to the limits of the sum, difference, product, quotient or variables. In general: If $R(u, v, w, \ldots)$ be a rational function of simultaneous variables, $u, v, w, \ldots$, and if $u, v, w \ldots$ have limits, $l, m, n \ldots$, — then $R(u, v, w, \ldots)$ has a limit $R(l, m, n \ldots)$ — always provided that this latter does not involve a division by 0, which has no sense.

If two V's differ at most by a σ, *and one has a limit, the other has the same limit.* Herewith there becomes possible a Calculus of the *Limits* of Variables instead of the Variables themselves. These limits are often far the more important, as we shall soon see.

A variable V (or sequence $v_1, v_2 \ldots$) is *bounded above* when we may assign a value M that it cannot exceed; then there is a certain smallest number its *upper limit*, which it cannot exceed. Similarly, it is *bounded below* when we may assign an m below which it cannot sink; then there is a certain greatest number, its *lower limit*, under which it cannot descend. If V may assume either of these limits as one of its values, then that limit is *attainable* and is a *Maximum* or a *Minimum;* otherwise it is *unattainable*. If V be a proper fraction, its limits, 0 and 1, are not attainable. When V may assume every value between its *attainable* limits, a and b, it is said to vary *continuously* in the *interval* $[a, b]$. But if a, or b, or both be unattainable, we shall say that it is continuous in $[a+0, b]$ or $[a, b-0]$, or $[a+0, b-0]$.

When to values of one magnitude correspond values of another, the magnitudes are called *Functions* of each other (Leibnitz). The one to which arbitrary values may be supposed given is called the *argument* or *independent variable;* the other, whose corresponding values may be reckoned or observed (or which at least exist), is called *the function*. Such are a number and its logarithm or sine; the radius of a sphere and its surface or volume; the elasticity of a medium and the velocity of an undulation through it; etc. . . . The general functional connection of x and y is expressed by $F(x, y)=0$. If this F be an entire polynomial in x and also in y, the F is *algebraic*, otherwise *transcendental*. If F be solved as to y, thus $y=f(x)$, then y is an *explicit* function of x; otherwise, an *implicit* function. If $f(x)$ be the quotient of two entire polynomials in x, then $f(x)$ is a *rational* function of x; otherwise, *irrational*. If to any one value of x there corresponds only one value of y, then y is a *one-valued* or *unique* function of x; if x be also a unique function of y, then there exists between x and y a *one-to-one correspondence*.

If $y=f(x)$ and $x=\phi(y)$ express the same correspondence between x and y, then f and ϕ denote *inverse* functions. A function may reduce to a *constant*; as $x^n=1$, for every finite x when $n=0$.

As x ranges in $[a, b]$, $f(x)$ will also range. Similarly $f(x)$ may have an upper limit M and a lower limit m; then $f(x)$ is *bounded* in $[a, b]$, $[m, M]$ is its *interval* and $M-m$ its *oscillation*. If either m or M be absent (or ∞), this *oscillation* is ∞. If we cut $[a, b]$ into n sub-intervals (a_k, b_k) $(k=1, \ldots n)$, then plainly the upper limit of $f(x)$ will be M in *at least one* $[a_k, b_k]$ and $> M$ in none; the *oscillation* will not be $> M-m$ in any $[a_k, b_k]$.

If as x approaches c, no matter how, $f(x)$ approaches $f(c)$ as its limit, then $f(x)$ *is continuous at* c (i.e. for $x=c$). Or, if $f(x)$ be bounded in $[c-\sigma, c+\sigma]$ and if the limit of its *oscillation* be 0 *for* σ vanishing, then $f(x)$ *is continuous at c*. That is, we must be able to *make* and *keep* the oscillation of $f(x)$ *small at will* by making and keeping the fluctuation in x *small at will*.

It may be that limit $f(c+\sigma)=f(c)$ only for $+\sigma$, then $f(x)$ is named continuous *right of c*; or that Lim. $f(c+\sigma)=f(c)$ only for $-\sigma$, then $f(x)$ is named continuous *left of c*. Only when $f(x)$ is continuous both right *and* left of c [$f(c)$ being the same], is $f(x)$ *continuous at c*.

If $f(x)$ be continuous at all points (values of x) right of a and left of b, it is named *continuous in* $[a, b]$.

The infinitesimal $[c-\sigma, c+\sigma]$ is called the (immediate) *vicinity* (or neighborhood) of c.

A change in the value of a v is conveniently denoted by Δv, read difference-v or Delta-v; hence Δx and Δy will denote corresponding (simultaneous) differences or changes in x and y.

If now $y=f(x)$ be continuous in $[a, b]$, we may cut this latter up into finite sub-intervals, Δx, each so small that the *oscillation* of y in each shall be $<\epsilon$. Hence Heine calls y *uniformly* (equably, *gleichmässig*) continuous in $[a, b]$. This corresponds to *uniform convergence*, as of a power-series, $y=\sum_{n=0}^{n=\infty} C_n x^n$ as opposed to non-uniform or *infinitely slow convergence* (Seidel, 1850). Finer discriminations must here be omitted.

Continuity is the supreme functional property with which the Calculus is concerned. Sine and cosine are everywhere continuous, but $\tan x$ is discontinuous for $x=(2n\pm1)\pi/2$, where $\tan x$ drops from $+\infty$ to $-\infty$. Similarly $\frac{1}{x-a}$ at $x=a$, an extremely important discontinuity. So $y=\left(e^{\frac{1}{x}}-1\right)\Big/\left(e^{\frac{1}{x}}+1\right)$ is discontinuous at $x=0$, leaping from -1 to 1; the *discontinuity* is 2. It is generally assumed that Continuity holds throughout the Processes of Nature.

Again, $y=\sin\frac{1}{x}$ is *not defined* for $x=0$, but whatever value be assigned it there, it remains *discontinuous*, since $\sin\frac{1}{x}$ vibrates infinitely fast between $+1$ and -1 for $x \doteq 0$.—Again, $f(c\pm\sigma)$ may approach a limit for σ vanishing, yet not approach $f(c)$. Thus, let $f(x)=x^2+\frac{x^2}{1+x^2}+\ldots$, a decreasing geometrical series, ratio $(1+x^2)^{-1}$, hence Lim. $f(x)=1+x^2$. Then as $x \doteq 0$, $f(x) \doteq 1$, Lim. $f(0\pm\sigma)=1$; but for $x=0$, $f(x)=f(0)=0$.—There are many immediate consequences of continuity, which we have no space to discuss here, such as: A function continuous in $[a, b]$ *attains* its upper and lower limits (its maximum and minimum); it also assumes at least once every value between $f(a)$ and $f(b)$,—a property, however, not peculiar to continuous functions (Darboux).

The notion of *function* is at once extended to *several variables*, $u=f(x, y, \ldots)$, one- or many-valued, algebraic or transcendental, etc., as before. Here each variable, as x, has its range or interval $[a, a']$; so y its $[b, b']$, etc. All possible sets of values $(x, y \ldots)$ form an assemblage or the Domain (D) of variation. Any set (or point) for which any variable has an extreme or border value, as a or a', b or b', is a *border* point; the assemblage of all such is the *border* or *contour* of D. A simple geometric depiction of D in rectangular co-ordinates for only two variables, x and y, would be a rectangle with sides $x=a$, $x=a'$, $y=b$, $y=b'$; of three variables, x, y, z, it would be a cuboid bounded by the planes $x=a$, $x=a'$, $y=b$, $y=b'$, $z=c$, $z=c'$, etc. The point (x, y) or (x, y, z) may be anywhere *in* or *on* the rectangle or cuboid. Such a D may be thought cut up into *elements*, infinitesimal rectangles or cuboids. Suppose any point $(a_1, b_1, \ldots)$ within an element. If now $f(x, y, \ldots)$ approaches $f(a_1, b_1, \ldots)$ as limit, as point $(x, y, \ldots)$ approaches point $(a_1, b_1, \ldots)$, *no matter how*, then $f(x, y, \ldots)$ is called *continuous at* $(a_1, b_1, \ldots)$. This amounts to saying that the *oscillation* of f shrinks toward zero as the element contracts, *no matter how*, about the point; that is, infinitesimal function-changes correspond to any and all infinitesimal argument-changes in the immediate vicinity of the point.

Any $f(x, y, \ldots)$ is called *continuous* within D when continuous at every point in D, *border included*; but *on* this border, as $x, y, \ldots$ approach a_1 b_1, . . . the point must not get without D. An f is continuous in the (immediate) *vicinity* of a point, when continuous within an infinitesimal D including that point.

In general, theorems holding for functions of one variable may be extended, with proper modifications, to functions of several variables.

Derivatives.— In the study of functional dependence, the main subject of scientific inquiry, it is of first importance to know how corresponding changes in the magnitudes are related. To discover this, we form the quotient of corresponding differences, $\frac{\Delta y}{\Delta x}$, called *Difference-Quotient* (*DQ*). In general, it is very complex, but breaks up into two parts, one *independent* of Δx, the other *vanishing with* Δx. The first is the important part and is named *Derivative* (*D*) or Differential Coefficient (*DC*). More formally, if $y=f(x)$ be a unique continuous function of x in $[a, b]$, and x be any point therein, and if $\frac{\Delta y}{\Delta x} \equiv \frac{f(x \pm \Delta x)-f(x)}{\pm \Delta x}$ approaches a limit as Δx approaches 0 *no matter how*, then that limit is called *Derivative* (*D*) of $f(x)$, as to x, at the point x. If $f(x)$ has a *D* at every point of $[a, b]$, the assemblage of them forms a new function, the Derivative of $f(x)$ for $[a, b]$, which we may write $f'(x)$ with Lagrange, or $Df(x)$ with Cauchy. Hence $\frac{\Delta f(x)}{\Delta x} = f'(x) + \sigma$.

Geometric Interpretation.—The Differential Calculus originated in the Problem of *Tangents*. Let P be any point of a curve referred to rectangular axes X, Y, and let P be between Q and Q'. Draw secants PQ, PQ', sloped ϑ and ϑ' to X, and ϕ to each other; draw ordinates through P, Q, Q'; through P and Q' draw parallels to X, meeting ordinates through Q and P at D and D'. Then $PD = \Delta x$, $D'Q' = \Delta' x$, $DQ = \Delta y$, $PD' = \Delta' y$. Also $\frac{\Delta y}{\Delta x} = \tan \vartheta$, $\frac{\Delta y'}{\Delta x'} = \tan \vartheta'$, $\tan (\vartheta' - \vartheta) = \tan \phi$. If now by approaching Q and Q' to P we can *make* and *keep* ϕ, and therefore $\tan \phi$, small at will, then the secants settle down into a common position called *tangent* to the curve at P (sloped τ to X) and the common limit of $\frac{\Delta y}{\Delta x}$ and $\frac{\Delta' y}{\Delta' x}$ is $\tan \tau$; or $f'(x) = \tan \tau$. But if P were an *angular point*, then PQ and PQ' would *not* tend together, $\frac{\Delta y}{\Delta x}$ would tend to one limit, the *progressive* differential coefficient, and $\frac{\Delta' y}{\Delta' x}$ to another limit, the *regressive* differential coefficient; only when these two *coalesce* is there a *Derivative* proper. Thus in $y = x\left(e^{\frac{1}{x}} - 1\right) \Big/ \left(e^{\frac{1}{x}} + 1\right)$, at the Origin, Lim. $\frac{\Delta y}{\Delta x} = \left(e^{\frac{1}{x}} - 1\right) \Big/ \left(e^{\frac{1}{x}} + 1\right)$, the *progressive* $DC = 1$, the *regressive* $DC = -1$, the two limiting positions of the secants are perpendicular.

How thickly may such *salients* be strewn along a curve? To have a *D*, i.e., to be *differentiable*, plainly the function must be continuous; it was long thought that this *necessary* condition was *sufficient*, that the continuous function possessed in general a *D*, save at certain special points. It was Riemann who first suggested (at least as early as 1861) the astonishing possibility that such an $f(x)$ as $\sum_{n=1}^{n=\infty} \frac{\sin (n^2 x)}{n^2}$, though everywhere continuous, was nowhere differentiable; but as he left no proof, it was generally thought he meant that it was possible to find such salients in every infinitesimal $[x, x + \Delta x]$, which was easy to show; but Weierstrass thought he meant strictly that the *D* did not exist for any value of x. In any case Weierstrass himself produced (18 July 1872) an example of such a function, $y = \sum_{n=0}^{n=\infty} b^n \cos(a^n x \pi)$,— where a is an odd integer, b a positive number < 1, and $ab > 1 + \frac{3}{2}\pi$,— which, though everywhere continuous, has nowhere a *D*, since the *progressive* and *regressive* Difference-Quotients are everywhere opposite in sign and increase oppositely toward ∞ as they pass over into Differential Coefficients ('Math. Werke von K. Weierstrass, II,' p. 71–74). *Geometrically*, in the graph of the differentiable function, the polygon formed by n consecutive chords tends toward the curve for $n \doteq \infty$, PQ and PQ' tend to coalesce as Q and Q' both approach P, the triangle PQQ' becomes flatter and flatter (we may suppose the arc QPQ' steadily enlarged under a microscope to its original length as Q and Q' close down on P), the curve we may say is *elementally straight* at P. But with Weierstrass's function the polygon remains always re-entrant, a zigzag, and consecutive chords, PQ and PQ', tend to *separate* at a straight angle. Such discontinuities may yet present themselves to the future student of nature.

If $y = x^2$ $\Delta y = 2x\Delta x + \overline{\Delta x}^2$, $\frac{\Delta y}{\Delta x} = 2x + \Delta x$, whence $D_x y \equiv \frac{dy}{dx} \equiv y_x = 2x$. Here y is the area of a square whose side is x, and $2x$ is the border of the square perpendicular to which the square expands, the *D* is *the front of variation*. Similarly, if $y = \pi x^2$, $D_x y = 2\pi x$, the circumference, the front of variation perpendicular to which x varies. If $y = x^3$, $D_x y = 3x^2 =$ the front of variation perpendicular to which x varies. If $y = \frac{4}{3}\pi x^3$, $D_x y = 4\pi x^2 =$ the sphere-surface, the front of variation perpendicular to x. For $y = x^4$, $D_x y = 4x^3 =$ again the whole front of variation, though here our powers of envisagement fail us. Thus we are conducted to the Derivation of *Assemblages*, for which the reader must be referred to this latter subject.

Kinematic Illustration.— Let $s =$ length of path of a moving point P, described in time t; Δs and $\Delta t =$ corresponding changes in s and t; then $\frac{\Delta s}{\Delta t} = \bar{v} =$ *average speed* during Δt; Lim. $\frac{\Delta s}{\Delta t} = D_t s =$ *instantaneous speed* at $t =$ *speed at the instant* t (i.e., end of t and beginning of Δt). There is no motion *at* the instant of time, nor *at* the point of path, but only *during* the time and space immediately about the point and instant. *Instantaneous speed* is a technical term for *limit of average speed* in the immediate vicinity of the point and instant. This instantaneous speed generally varies with t, and its D as to t is named *acceleration* and is written $\frac{dv}{dt}$. The product of this acceleration by the *mass* of the moving P yields the all-important motion of *force*. The D of this acceleration might be called *second acceleration*, but the notion has not yet proved useful in Mechanics (q.v.).

The notation for D may be this or that. Newton used the dot, thus $\dot{s}$, to denote derivative as to t, as still do the British; Lagrange, the accent, $F'(x)$, still common; Cauchy, the *operator D*, with or without subscribed argument x; others subscripts, as y_x, y_1, etc.; most common, most expressive, but possibly misleading is the Leibnitzian $\frac{dy}{dx}$, *not* a fraction (thus far at least), not the quotient of dy divided by dx, but the limit of the fraction $\frac{\Delta y}{\Delta x}$ for Δx vanishing, no matter how. Sometimes we write $\frac{d}{dx}$ for D_x, thus: $y_x \equiv D_x y \equiv \frac{d}{dx} y \equiv \frac{dy}{dx}$, etc.

Lagrange ('Théorie des Fonctions,' I) attains the notion of *Derived Functions* (or D's) by substituting $x + \xi$ for x in $F(x) = a_0 + a_1 x + a_2 x^2 + \ldots a_n x^n$, whence $F(x+\xi) = F(x) + F'(x) \cdot \xi + \frac{F''(x)}{\underline{|2}} \cdot \xi^2 + \ldots + \frac{F^{(n)}(x)}{\underline{|n}} \cdot \xi^n$, where each F turns out to be formed from the preceding in the same way; they are the *Derived Functions* of F. A near-lying Generalization considers $f(x) = \sum_{n=0}^{n=\infty} a_n (x-a)^n$, supposed absolutely convergent for all values of $|x-a| < +R$, i.e., for x within $[a-R, a+R]$. Then in the same [ ] all the ∞ series

$$\sum_{n=m}^{n=\infty} \frac{\underline{|n}}{\underline{|n-m}} a_n (x-a)^{n-m} (m = 1, 2, 3, \ldots)$$

will also converge absolutely. Denote them in turn by $f'(x)$, $f''(x)$, ... Choose ξ so that $|x-a| + |\xi| < R$; then the series $\sum_{m=0}^{m=\infty} \frac{f^{(m)}(x)}{\underline{|m}} \cdot \xi^m$ will also converge absolutely in the same [ ] and will equal $f(x+\xi)$. These Sums $f'(x)$, $f''(x)$, ... are called 1st and 2d, ... *Derived Functions* of $f(x)$, which may be called its own 0th Derived Function. If instead of the inconvenient Lagrangian accents we put Cauchy's *D's* with proper exponents, we perceive that these latter, denoting order of differentiation, obey the same laws as ordinary exponents:

$$D^{m+n} = D^m . D^n = D^n . D^m, \text{ etc.}$$

It is usual, though not quite satisfactory, to denote the value of any derived function at any point $(x = a)$ by writing a for x, thus: $f^{(n)}(a)$. At this stage the D-notation is not so convenient. These special values are seen to be $f^{(n)}(a) = \underline{|n} . a_n$. On finding hence the a's and substituting in the definition of $f(x)$ we get $f(x) = f(a) + \sum_{n=1}^{n=\infty} \frac{f^{(n)}(a)}{\underline{|n}} (x-a)^n =$

$$\sum_{n=0}^{n=\infty} \frac{f^{(n)}(a)}{\underline{|n}} (x-a)^n.$$

Such is the ordinary *Taylor's Series*, or Maclaurin's (more justly Stirling's) in case $a = 0$.

Lagrange supposed (amazingly, Picard) *any arbitrary* $f(x)$ expansible in positive integral powers of $(x-a)$, except for special values of a. However, presupposed only uniqueness and continuity in a definite interval, there may be *no* value of a in the interval for which such expansion is possible. Thus, $f(x) = (-x)^p$ for $x < 0$ and $= x^p$ for $x \geqq 0$ cannot be developed in positive integral powers of x for x positive and p not integral. Hence this Lagrangian notion of derived function, while in general agreeing with the notion of D as limit of difference-quotient, is not yet so universal.

The notion of *Differential*, though unnecessary at this stage, is commonly introduced thus: From $\frac{\Delta y}{\Delta x} \equiv \frac{\Delta f(x)}{\Delta x} = f'(x) + \sigma$, $\Delta y \equiv \Delta f(x) = f'(x) \Delta x + \sigma \Delta x$. This first part of $\Delta f(x)$, namely, $f'(x) \Delta x$, proportional to Δx and of the same order of infinitesimality, may be defined as the *Differential of* $f(x)$ and may be denoted by $df(x)$, which is thus a *finite variable* for $\Delta x \lessgtr 0$. For $f(x) = x$, we have $dx = \Delta x$, which is therefore *differential* of x. Hence $\frac{dy}{dx} \equiv \frac{df(x)}{dx} = f'(x)$, i.e., the D of $f(x)$ as to $x =$ the *quotient* of the *differentials* of $f(x)$ and x (Leibnitz). Here $\frac{dy}{dx}$ is strictly a *fraction* whose terms are by no means "ghosts of departed quantities" (Berkeley). *Geometrically, dy is the* Δy *prolonged up* to the tangent at P, = change of the ordinate of the tangent when abscissa changes by dx; Lim. $\frac{\Delta y}{dy} = 1$. This notion of differential, though useful in geometry, mechanics and elsewhere, rather embarrasses the theoretical development of the subject. Hence the terms *Differentiation* (= Derivation), to *differentiate*, and hence the names Differential Calculus, Differential Coefficient.

On these bases the structure of the DIFFERENTIAL CALCULUS may now be safely erected. Primary formulæ, easily established, are as follows (D meaning always *Derivative as to x, u, v*, etc., being *simultaneous* functions of x):

$$D(u + v - w) = Du + Dv - Dw;$$

$$D(uv) = Du \cdot v + u \cdot Dv = uv \left(\frac{Du}{u} + \frac{Dv}{v}\right);$$

$$D\left(\frac{u}{v}\right) \equiv \left(\frac{u}{v}\right)' = \frac{u' v - u v'}{v^2};$$

$$(u \pm c)' = u'; \quad (cu)' = c \cdot u'.$$

Very important is *Mediate Derivation*, when y is function of a function of x, as $y = \phi(u)$, $u = f(x)$, hence $y = \phi \{ f(x) \} = F(x)$. *If then* ϕ *and* f *have definite D's*, $\phi'(u)$ and $f'(x)$, we have $\frac{\Delta y}{\Delta x} = \frac{\Delta y}{\Delta u} \cdot \frac{\Delta u}{\Delta x}$, hence $y_x = y_u \cdot u_x = \phi'(u) \cdot f'(x)$.

But y_x may exist even when the supposition fails, and this rule with it.

In particular, if $y=f(x)$ and inversely $x=\phi(y)$ and if either variable has a $D\neq 0$ so has the other. For if $f'(x)\equiv \text{Lim.}\ \frac{\Delta y}{\Delta x}\neq 0$, then $\frac{\Delta x}{\Delta y}=1\ \Big/ \frac{\Delta y}{\Delta x}$; hence $\text{Lim.}\ \frac{\Delta x}{\Delta y}=\frac{1}{f'(x)}$ or $\phi'(y) =\frac{1}{f'(x)}$, i.e., in general, the D's of x as to y and of y as to x are *reciprocals of each other:* $y_x \cdot x_y=1$.

If $y'\equiv f'(x)$ be $+$, then x and y increase (or decrease) together, $f(x)$ is called *increasing* at x. But if y' be $-$, then x and y change oppositely, $f(x)$ is *decreasing* at x.

Hence if $f'(c)\neq 0$, $f(x)$ must be $> f(c)$ on one side of the point c, and $< f(c)$ on the other. Hence *Rolle's Theorem:* If $f(x)$ vanishes at a and b and has a D at every point within $[a, b]$, then this D, $f'(x)$ vanishes at some point within $[a, b]$.

Now, $f(x)\equiv(b-a)\,\{\phi(x)-\phi(a)\}-(x-a)\,\{\phi(b)-\phi(a)\}$ is such an $f(x)$, made to order, ϕ being differentiable within $[a, b]$. Hence $f'(x)\equiv(b-a)\phi'(x)-\{\phi(b)-\phi(a)\}$ must $=0$ for some $\bar{x}$ in $[a, b]$. Hence $\phi(b)-\phi(a)=(b-a)\phi'(\bar{x})$. Commonly we write a for x and $x+h$ for b; then $\bar{x}=x+\theta h$, where θ is in $[0, 1]$, so that $\phi(x+h)-\phi(x)=h\phi'(x+\theta h)$, the extremely important formula for *finite increments.* Hence we see at once that if the D is everywhere 0 within an interval, the function is constant in that interval; and hence that two functions whose D's are equal in an interval can themselves differ only by a constant in that interval — a Theorem at the base of the Integral Calculus.

Passing now to D's, we first attempt $y=e^x$. Hence

$$y+\Delta y=e^{x+\Delta x}=e^x\cdot e^{\Delta x}=e^x\left\{1+\Delta x+\frac{\overline{\Delta x}^2}{\lfloor 2}+\ldots\right\}.$$

Hence

$$\frac{\Delta y}{\Delta x}=e^x\left(\frac{e^{\Delta x}-1}{\Delta x}\right)=e^x\left[1+\frac{\Delta x}{2}+\frac{\overline{\Delta x}^2}{\lfloor 3}+\ldots\right].$$

This [ ] is term by term, except the first, less than $e^{\Delta x}$, whose limit is 1; hence Lim. [ ] is 1: hence $\text{Lim.}\ \frac{\Delta y}{\Delta x}=e^x$, or $De^x=e^x$. *The exponential e^x is unchanged by Derivation as to its exponent.* Hence $\mathbf{D}e^u=e^u\cdot u_x$. Hence, if $y=\log x$, $e^y=x$, $e^y\cdot y_x=1$, $y_x=e^{-y}=\frac{1}{x}$; or $D\log x=\frac{1}{x}$. Hence $\mathbf{D\ log}\ u=\frac{u_x}{u}$. Hence, if $y=x^m$, $\log y=m\log x$; $Dy=Dx^m=mx^{m-1}$.

For $y=\sin x$,

$$2\Delta y=\sin(x+2\Delta x)-\sin x$$
$$=2\cos(x+\Delta x)\sin\Delta x;$$
$$\frac{\Delta y}{\Delta x}=\cos(x+\Delta x)\frac{\sin\Delta x}{\Delta x};\text{ hence}$$
$$y_x=D\sin x=\cos x=\sin\left(x+\frac{\pi}{2}\right):\text{ hence}$$

$\mathbf{D\ sin}\ u=\mathbf{cos}\ u\cdot u_x$. Hence $D\cos x=-\sin x =\cos\left(x+\frac{\pi}{2}\right)$. Hence derivation of sine and cosine as to the angle merely adds $\frac{\pi}{2}$ to the angle. Also, $D\tan x=1+\overline{\tan x}^2=\overline{\sec x}^2$. If $y=\sin^{-1}x$, $\sin y=x$, $y_x\cdot\cos y=1$, $y_x=\frac{1}{\sqrt{1-x^2}}$; hence $D\sin^{-1}u=\frac{u_x}{\sqrt{1-u^2}}$. Similarly for $\cos^{-1}$. If $y=\tan^{-1}x$, similarly $D\tan^{-1}x=\frac{1}{1+x^2}$. Specially,

$$D\sin^{-1}\frac{x}{a}=\frac{1}{\sqrt{a^2-x^2}},\quad D\tan^{-1}\frac{x}{a}=\frac{a}{a^2+x^2}.$$

Similarly we treat the hyperbolic sine and cosine and tangent (hsx, hcx, htx), and their inverses $hs^{-1}x$, $hc^{-1}x$, $ht^{-1}x$, with the important results: $Dhsx=hcx$, $Dhcx=hsx$, $Dhtx=1-\overline{htx}^2$,

$$Dhs^{-1}x=\frac{1}{\sqrt{x^2+1}},\quad Dhc^{-1}x=\frac{1}{\sqrt{x^2-1}},$$
$$Dht^{-1}x=\frac{1}{1-x^2},$$

with easy generalization for u and $\frac{x}{a}$, — formulæ especially important in Integration. By Derivation the anti-transcendentals are thus reduced to algebraic forms, while the exponentials and goniometrics return into themselves; hence the inverse of Derivation, whatever it may be, applied to algebraic forms, may give rise to transcendentals. So much for ordinary *algebraic* and simply *periodic* functions.

The *Infinite Series* cannot always be differentiated by differentiating term by term, but only under certain conditions of *equable convergence. If* each term $f_n(x)$ of $f(x)=L\sum_{n=0}^{n=\infty}f_n(x)$ be unique and continuous *and if* Σ converge, for every x in $[a, a+d]$, *and if* $\underset{x=a+0}{L}f(x)=f(a)$,— for such a series the Theorem holds: *If* each term has a finite progressive DC, $f_n'(a)$, and *if* the series of DC's, $\sum_{n=0}^{n=\infty}\frac{f_n(a+\Delta x)-f_n(a)}{\Delta x}$, converges equably for every $\Delta x>0$ and $<d$, *then* $\sum_{n=0}^{n=\infty}f_n'(a)$ also converges and

$$=L\sum_{n=0}^{n=\infty}\frac{f_n(a+\Delta x)-f_n(a)}{\Delta x},\text{ for }\Delta x\doteq+0.$$

In general, this narrower Theorem will answer: *If,* for every x in $[a, a+d]$, each $f_n(x)$ is unique, continuous, and has a D (and for $x=a$ at least a progressive DC), and if both $\sum_{n=0}^{n=\infty}f_n(x)$ and $\sum_{n=0}^{n=\infty}f'_n(x)$ converge, the latter equably, *then* $Lf(x)=f(a)$, and $f(x)$ has a progressive DC at a, which is $\sum_{n=0}^{n=\infty}f_n'(a)$; i.e., we form the D of the infinite series by summing (to ∞) the D's of the terms (for details see *Real Variable, Theory of Functions of the.*

For D of $f(z)$ as to z, where $z=x+iy$, see *Complex Variable, Theory of Functions of.*[*]

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[*] The simultaneous variation 0, x and y is vividly depicted by the graph of $f(x, y)=0$. But we may image it otherwise, thus: Let P and Q depict the variables x and y, one moving on X, the other on Y, and let the elastic rod PQ connect them. As P moves uniformly along X, Q will slide up and down along Y, obeying $f=0$. The assemblage of x-values is

A D of a first D is called a *second D,* written variously $f''(y)$, Dx^2, $\frac{d^2}{dx^2}$, and so on for the 3d, 4th, ... nth D's. We see at once,

$$D^n x^m = \frac{\underline{|m}}{\underline{|m-n}}\, x^{m-n}, \quad D^n \frac{\sin}{\cos}\, x = \frac{\sin}{\cos}\left(x + n\frac{\pi}{2}\right),$$

$$D^n \frac{a}{(x+b)^m} = (-1)^n \frac{a\,\underline{|m+n-1}}{\underline{|m-1}\,(x+b)^{m+n}}.$$

A rational fraction must first be decomposed into *such* fractions. The exponential e^x repeats itself steadily, $D^n e^{ax} = a^n e^{ax}$; hence $\phi(D)e^{ax} = \phi(a)e^{ax}$, ϕ being algebraic and rational. The log x is at once reduced to a fraction by $D \log x = \frac{1}{x}$. For a product uv we have *Leibnitz's Theorem*:

$$D^n(uv) = u_n v + n u_{n-1} v_1 + \frac{n(n-1)}{1\cdot 2} u_{n-2} v_2 + \dots,$$

precisely as in the Bionomial Theorem, the subscripts denoting the D's. For a quotient $y = \frac{u}{v}$, we write $u = vy$, $u_1 = v_1 y + v y_1$, $u_2 = v_2 y + 2v_1 y_1 + v y_2, \dots, u_n = v_n y + n v_{n-1} y_1 + \dots + v y_n$. From these $(n+1)$ simultaneous equations we form the *eliminant* of the n unknowns, $y, y_1, y_2, \dots y_{n-1}$; this eliminant is linear in y_n and yields

$$y_n = \frac{(-1)^n \underline{|n}}{v^{n+1}} \begin{vmatrix} u & v & 0 & 0 & 0 & \dots \\ u_1 & v_1 & v & 0 & 0 & \dots \\ \frac{u_2}{\underline{|2}} & \frac{v_2}{\underline{|2}} & v_1 & v & 0 & \dots \\ \dots & \dots & \dots & \dots & \dots & \dots \\ \frac{u_n}{\underline{|n}} & \dots & \dots & \dots & v_1 & v \end{vmatrix}$$

Applications.—1. Let P be any ordinary point of a curve, S the foot of the ordinary y, T and N the feet (on X) of tangent and normal at P. Since $y_x = \tan \tau$, $SN = y \cdot y_x$, $ST = y \cdot x_y$, and we easily express PN, PT, etc. Also, if ϕ = angle of intersection of $y = f(x)$ and $Y = F(x)$, then $\tan \phi = \frac{y_x - Y_x}{1 + y_x Y_x}$. If the curves touch, the numerator $= 0$; if they are perpendicular, the denominator $= 0$.

2. *Envelopes.*—Let $F(x, y; p) = 0$ (1) be a system of curves distinguished by varying values of the parameter p. For any special value of p, $F(x, y; p) = 0$ will be one curve and

$$F(x, y; p + \varDelta p) = 0 \qquad (2)$$

a neighboring curve. Where do they meet? What relation connects x and y of the intersection, I, of any such pair? We must combine (1) and (2) and eliminate p. If in the result we pass to the limit for $\varDelta p \doteq 0$, we shall find the *locus of the intersection of consecutives* (or the *Envelope*) of the system. For (2) we may put (1)–(2), or still better

$$\frac{F(x, y; p + \varDelta p) - F(x, y; p)}{\varDelta p} = 0. \qquad (3)$$

It will be equivalent to invert the procedure, to pass to the limit and then eliminate p. So we get

$$F_p(x, y; p) = 0, \qquad (4)$$

between which and (1) we now eliminate p. This eliminant connects x and y for every intersection of two consecutives of the system, every *instantaneous pivot* about which the curve *starts to turn* into a neighboring position. *But this is not all.* It connects the x and y of all other points where meet two curves (branches) corresponding to the same p, as may thus be seen. Assign any pair of values to x and y, i. e., take any point in the plane, and ask what members of $F = 0$ pass through it, i.e., what are the corresponding values of p? There are n such, if F be of nth degree in p. When will two of these p-roots be equal? Only when the p-discriminant of $F = 0$ vanishes; i.e., when the eliminant of p between $F = 0$ and $F_p = 0$ vanishes, as we know from *Algebra*. Hence this eliminant connects x and y for all points where meet two curves corresponding to the same or equal p's. This will include all *cusps* and *nodes* as well as *instantaneous pivots;* hence the p-eliminant $= 0$ will be the equation of all *cusp-loci* and *node-loci* as well as of *envelope* proper.

Illustration.— Find the envelope of a straight line AB on which the intercept between X and Y is a constant c. The equation of AB is

$$\frac{x}{a} + \frac{y}{\sqrt{c^2 - a^2}} - 1 = 0 = F(x, y; a).$$

Another $A'B'$ of the system is

$$\frac{x}{a'} + \frac{y}{\sqrt{c^2 - a'^2}} - 1 = 0 \qquad (a' = a + \varDelta a).$$

and another $A''\,B''$ is

$$\frac{x}{a''} + \frac{y}{\sqrt{c^2 - a''^2}} - 1 = 0 \qquad (a'' = a - \varDelta a).$$

The Intersections I' and I'' of these two with AB are definite. As A' and A'' close down upon and coalesce in A, I' and I'', always definite, close down upon and coalesce in their common limit I, the *instantaneous pivot* about which AB starts to turn. Differentiating and eliminating

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strewn evenly along Y, the assemblage of y-values is not strewn evenly along Y, but is stretched, compressed, folded, crumpled in countless ways. The study of y_x becomes the study of the *intimate texture* of this Y-axis bearing the assemblage of y-values.

If now $z = x + iy$, $w = u + iv$ be *complex variables*, and $w = f(z)$, then w is indeed compounded of x and y, not however in just any combination, as $x^2 + y^2$, $x + 2iy$, but only in the one combination, $x + iy$. The domain of z is the XY-plane, of w the UV-plane, as which two we may take the floor and a wall or the ceiling. Not having a 4th dimension at command, we cannot envisage $w = f(z)$ as a surface, as we did $y = f(x)$ as a curve. We must again think of two points P and Q, in XY and UV, connected by an elastic rod, PQ; as P moves about in XY, Q moves about in UV, obeying $w = f(z)$. We may think of the texture of XY as uniform, then the texture of UV will not be uniform, but stretched, compressed, folded and crumpled in countless ways. The study of w_z now becomes the study of this intimate *texture* of UV. As in $y = f(x)$ the derivative y_x is the part of the $\frac{\varDelta y}{\varDelta x}$ that is entirely independent of $\varDelta x$, so w_z must be independent of $\varDelta z$: as y_x is the same whether $\varDelta x \doteq +0$ or $\doteq -0$, so in general w_z is the same no matter how $\varDelta z \doteq 0$, along whatever path of value. *Geometrically* this signifies that if p, p' be two intersecting paths of z, and q, q' the corresponding intersecting paths of w, then p and p', q and q', *intersect under the same angle.* Hence the angles of the curvilinear triangle (q, q', q'') = the angles of the corresponding curvilinear triangle (p, p', p''); hence the two corresponding infinitesimal rectilinear triangles of the chords (or tangents) will be similar, the *ratio of similitude* being w_z, which of course varies from point to point: the one plane is a map of the other and the textures are *similar in the smallest parts.* Such is the geometric interpretation of the Derivative of *Functions of a Complex Variable* (q.v.). It would seem that such interpretations might be indefinitely extended.

a we find the 4-cusped Hypocycloid, $x^{2/3}+y^{2/3}=c^{2/3}$, as the envelope, or path of the *instantaneous pivot I*.

Hence Plücker's double conception of a curve as *path* of a point gliding along a straight line that turns about the point, and *envelope* of a straight line that turns about a point that glides on the straight line. The relation connecting the corresponding magnitudes, arc-length s (of the path) and angle a (through which the straight line turns), is the *intrinsic equation* of the curve. The $DQ, \frac{\Delta a}{\Delta s}$, is named *average curvature* of Δs; its limit $\frac{da}{ds}$ is named *instantaneous curvature* (κ) at P. Plainly $\Delta a = \Delta\tau$; hence

$$\kappa = \frac{d\tau}{ds} = \frac{d\tau}{d\tan\tau}\cdot\frac{d\tan\tau}{dx}\cdot\frac{dx}{ds} = \frac{y''}{(1+y'^2)^{\frac{3}{2}}}.$$

(N.B. *The Differential Triangle PDQ* formed by $\Delta x, \Delta y, \Delta s$, yields at once

$$s_t^2 = x_t^2 + y_t^2, \frac{dx}{ds} = \frac{1}{\sqrt{1+y_x^2}}, \frac{dy}{ds} = \frac{y_x}{\sqrt{1+y_x^2}}\Big)$$

In the circle κ is the constant $\frac{1}{r}$, hence the curvature of the circle is the *reciprocal of the radius*. For any point of any curve the reciprocal of this curvature is called the *radius of curvature*, ρ; hence this ρ at any point is the *radius of a circle of equal curvature*, hence called *circle of curvature*.

To illustrate.—Draw PT and PN, tangent and normal to the curve; about K' and K'' on PN, with radii $\rho' > \rho$ and $\rho'' < \rho$, through P draw two circles, one less, the other greater than the circle of curvature. Let ρ' and ρ'' approach and coalesce in ρ; then K' and K'' approach and coalesce in K, the *centre* of curvature, and the ⊙ about K is the *osculatory circle*.

Otherwise, through P, and Q' and Q'' on opposite sides of P, draw a circle. Let mid-normals to PQ', PQ'' meet PN at S' S'', and each other at S'''; as Q' and Q'' approach and coalesce in P, S', S'', S''' all approach and coalesce in their common limit, S (or K). Hence the osculatory circle = circle *through three consecutive points* of a curve, and *centre of curvature = intersection of two consecutive normals*.

The co-ordinates (u and v) of K are given by $u = x - \frac{y''}{y'}(1+y'^2)$, $v = y + \frac{1}{y'}(1+y'^2)$. Eliminating x and y between these equations and the equation of the curve, we get the equation connecting u and v for every K, i.e., the *equation of the Evolute*, or *locus of the centres of curvature* of the original curve (the *Involute*). Since $v_u \cdot y_x + 1 = 0$, the tangents at corresponding P and K are perpendicular, *the normal to the involute* is *tangent to the evolute*. Also, it is easy to prove that the arc-length in *Evolute* can differ only by a constant from the *radius of curvature* (ρ) in *Involute*. Hence a point of a cord held tight while being unwound from the *evolute* must trace an *involute*; hence the former name. To any involute there is only one evolute, but to any evolute there are infinitely many (so-called parallel) involutes,—an excellent illustration of a one-valued determination with many-valued inverse, and also of the definiteness of differentiation as compared with the indefiniteness of its inverse, Integration (see below). Some curves reproduce themselves in their evolutes, notably Cycloid and Logarithmic Spiral, which latter inspired the engraving and epitaph on the tomb of Jacob Bernoulli (1654–1705): *Eadem mutata resurgo*. The general theory of the Contact of curves, Asymptotes, etc., beautifully exemplifies this Calculus, but cannot be treated here (see *Curves, Higher Plane*).

Indeterminates.—If for $x=a$ both terms of a fraction $y=\frac{\phi(x)}{\varphi(x)}$ vanish, then y loses definiteness, taking the unmeaning form, $y' = \frac{\phi(a)}{\varphi(a)} = \frac{0}{0}$. (Cf. *Algebra*).

The fundamental example is $y = \frac{x^m - a^m}{x-a}$, for $x=a$. However, we may still seek Lim. $\frac{\phi(x)}{\varphi(x)}$ for $x \doteq a \neq 0$, though it would be arbitrary to assume this limit as the *value* of $\frac{\phi(a)}{\varphi(a)}$ (Darboux). If $x-a$ be removable from both terms, we may cancel it for $x \neq a$, and then seek the limit for $x=a$. Thus $\frac{x^3-a^3}{x-a} \equiv x^2+ax+a^2$ for $x \neq a$; this last $=3a^2$ for $x=a$; hence $\lim_{x \doteq a} \frac{x^3-a^3}{x-a} = 3a^2$, but not $\frac{x^3-a^3}{x-a} = 3a^2$ for $x=a$, unless arbitrarily. Now $\lim_{x \doteq a} \frac{\phi(x)}{\varphi(x)} = \lim_{x \doteq a} \frac{\phi'(a)}{\varphi'(a)}$ for $\phi(a) = 0 = \varphi(a)$ (L'Hospital). Hence the ordinary rule: Take the limit of the quotient of the D's of the terms at the critical value. Or, expand the terms in the neighborhood of a, simplify, cancel the vanishing common factor, and evaluate for $x=a$. Similarly, with proper modification, we treat $\frac{\infty}{\infty}$; and $\infty - \infty$, reduced to $\frac{0}{0}$. Indeterminate exponentials like 1^∞, 0^∞ etc., are first reduced to $\frac{0}{0}$ by passing to Logarithms.

Maxima and Minima are points where a curve ceases to ascend and begins to descend; accordingly at such points the D must change sign; hence must pass through 0, if *continuous*. This passage is from + to — for a maximum, from — to + for a minimum. Hence the ordinary rule: To maximize or minimize $f(x)$, put $f'(x)=0$; the x-roots will yield maximal or minimal values of $f(x)$ according as they make $f''(x)$ negative or positive. For $f''(x)=0$, treat 3d and 4th D's precisely as the 1st and 2d D's. The same rules result from expanding $f(x)$, as by Taylor's Theorem. Special cases (as of D discontinuous) call for special treatment, often preferably geometrical or mechanical.

The geometric depiction of a *function of two independent variables*, $z=f(x,y)$ or $F(x, y, z)=0$, is of course a *surface* (S): at any point (x, y) in the plane erect the corresponding value of z; the ends of these z's form S. We may pass on S from P to P' in ∞ of ways; e.g., parallel to ZX; then x and z would change, but not y. Hence there would be simultaneous Δx and Δz, but $\Delta y = 0$. Then $L\frac{\Delta z}{\Delta x}$ is written $\frac{\partial z}{\partial x}$ (Jacobi), and is read *partial D of z as to x*. Similarly, for a path of P parallel to YZ, there are simultaneous Δy and Δz, but $\Delta x = 0$; $L\frac{\Delta z}{\Delta y} = \frac{\partial z}{\partial y} =$ *partial D of z as to y*.

For $u = f(x, y, z)$ institution fails, but we think each P in $[x, y, z]$ as *weighted* with the proper u instead of erecting this u perpendicular to $[x, y, z]$. As P moves, the weight u changes. For motion parallel to X both Δy and Δz are 0 and $L\frac{\Delta u}{\Delta x} = \frac{\partial u}{\partial x}$, etc. Of course, the foregoing presumes that z and u actually admit of the derivations in question.

Differentials, Partial and Total.—By Definition, $d_x u = \frac{\partial u}{\partial x} \cdot \Delta x =$ *partial Differential* of u as to x, etc. $du = \frac{\partial u}{\partial x} \cdot \Delta x + \ldots = \frac{\partial u}{\partial x} \cdot dx + \ldots =$ *total Differential of u*. $\Delta u = \frac{\partial u}{\partial x} \cdot \Delta x + \ldots + \epsilon \Delta x + \ldots =$ *total Difference — u*.

Geometrically, on $z = f(x, y)$, the path of x-change is parallel to ZX, hence $\frac{\partial x}{\partial z} = \tan \tau$, as before. Similarly $\frac{\partial z}{\partial y} = \tan u$. The plane through the tangents to these paths (at P) is in general the plane tangent at $P(x, y, z)$ to S. Clearly its equation is $w - z = (u - x)\frac{\partial z}{\partial x} + (v - y)\frac{\partial z}{\partial y}$ (u, v, w being the current co-ordinates for the plane). This equation assumes the symmetric form $(u - x) F_x + (v - y) F_y + (w - z) F_z = 0$, since $\frac{\partial z}{\partial x} = -\frac{F_x}{F_z}$, etc. Hence the equations of the normal are $\frac{u - x}{F_x} = \frac{v - y}{F_y} = \frac{w - z}{F_z}$.

As to *existence*, the tangent plane is conditioned like the tangent line. Through $P(x, y, z)$ and two neighbor points, Q and R (as $x + \Delta x, y, z + \Delta_x z$, and $x, y + \Delta y, z + \Delta_y z$), pass a secant plane Π. Let R and Q descend any wise upon P. If the tiltings of Π approach o, if Π settles down toward the same fixed position, no matter how Δx and Δy approach 0, i.e. independently of $\frac{\Delta y}{\Delta x}$ and y_x, then the limiting position of Π is the tangent plane at P. But at the vertex P of a cone $(x^2 + y^2 = m^2 z^2)$, Π rolls forever around the cone as Q and R circle around P. Here, at $(0, 0, 0)$, $\frac{\partial z}{\partial x} = \frac{x}{m^2 z}$ and $\frac{\partial z}{\partial y} = \frac{y}{m_2 z}$ lose all meaning, as do tangent plane and normal.

In general there is no such notion as Total Derivative of $z = f(x, y)$, x and y independent; but if both be functions of an arbitrary t, we have the *Total D* of z as to this t:

$$\frac{dz}{dt} = \frac{df}{dt} = \frac{\partial f}{\partial x} \cdot \frac{dx}{dt} + \frac{\partial f}{\partial y} \cdot \frac{dy}{dt},$$

an extension of mediate derivation. Of course, the possibility and definiteness of the operations are implied. Hence again

$$dz \equiv df = \frac{\partial f}{\partial x} \cdot dx + \frac{\partial f}{\partial y} \cdot dy,$$

or the *Total Differential* = the sum of the *Partial Differentials*. For $t = x$, $\frac{dz}{dx} = f_x + f_y \cdot y_x$, or $dz = f_x.dx + f_y.dy$, a fundamental theorem holding when at (x, y) the DQ

$$\frac{f(x + \Delta x, y + \Delta y) - f(x, y + \Delta y)}{\Delta x}$$

is an *equably continuous function* of y and Δx.

Higher D's are *pure* when the same *Independent Variable* is retained, *mixed* when it is changed. So $\frac{\partial^2 z}{\partial x^2}$, $\frac{\partial^2 z}{\partial y^2}$ are pure, but $\frac{\partial^2 z}{\partial x \, \partial y}$ is mixed. In mixed D's the question arises: Is the *order of Derivation indifferent?* The answer is, Yes, $\frac{\partial^2 z}{\partial x \, \partial y} = \frac{\partial^2 z}{\partial y \, \partial x}$, but only under conditions. For a power-series the case is clear, but the general investigation is subtle, and the result is involved and tedious. The theorem holds: When, for x in $[a - h, a + h]$ and y in $[b - k, b + k]$, $f(x, y)$ is uniquely defined, *and* the $\frac{1}{2}(n - 1)(n + 2)$ DC's

$$\frac{\partial^m f}{\partial x^{m-r} \partial y^r} \begin{pmatrix} r = 0, 1, \ldots m \\ 1 \leqq m \leqq n - 1 \end{pmatrix}$$

exist and are finite, *and* all the mixed ones are continuous as to both x and y, *then* everywhere in the same rectangle $(2h, 2k)$ all the other mixed DC's below the nth order exist, and the order of derivation is indifferent. Also, if, *besides*, everywhere in the rectangle the $(n - 1)$ mixed DC's of nth order, $\frac{\partial^n f(x, y)}{\partial x^{n-1} \partial y}$, $\frac{\partial^n f(x, y)}{\partial x^{n-2} \partial y^2}$, $\ldots$ $\frac{\partial^n f(x, y)}{\partial x \, \partial y^{n-1}}$, exist finite, *and* at $[a, b]$ are continuous as to both x and y, *then* all other mixed DC's exist at $[a, b]$, the order of derivation being indifferent. Space is wanting for the proofs.

The Taylorian Series or *Law of the Mean* may now be extended, under proper conditions, to develop $f(x, y)$ near (x, y), thus:

$$f(x + h, y + k) = f(x, y) + \left\{ h \frac{\partial f}{\partial x} + k \frac{\partial f}{\partial y} \right\}$$

$$+ \frac{1}{\underline{|2}} \left\{ h^2 \frac{\partial^2 f}{\partial x^2} + 2hk \frac{\partial^2 f}{\partial x \, \partial y} + k^2 \frac{\partial^2 f}{\partial y^2} \right\} \ldots$$

$$+ \frac{1}{\underline{|n}} \sum_{p=0}^{p=n} n_p \frac{h^{n-p} k^p \partial^n f(x + \theta h, y + \eta y)}{\partial x^{n-p} y^p}.$$

Symbolically,

$$f(x+h, y+k) = \Sigma e \; h \frac{\partial}{\partial x} + k \frac{\partial}{\delta y} f(x, y).$$

The last term is the remainder R_n, which must converge upon 0, for $n \doteq \infty$, to be neglected. A sufficient condition therefore is that the partial D's of f remain finite near (x, y) for $n \doteq \infty$. This is not a necessary condition, however, to find which is not easy nor attempted here.

Geometrically, take the tangent plane at P as XY, the normal as Z. Develop $z = f(x, y)$

near $P(0, 0, 0)$ so that $\Delta x = h = x$, $\Delta y = k = y$, $\Delta z = z$. We have

$$z = f(x, y) = \left\{ x\frac{\partial}{\partial x} + y\frac{\partial}{\partial y}\right\} f(0, 0) +$$

$$\frac{1}{\underline{|2}}\left\{x^2\frac{\partial^2}{\partial x^2} + 2xy\frac{\partial^2}{\partial x\,\partial y} + y^2\frac{\partial^2}{\partial y^2}\right\}f(0, 0) + \}x^3, y^3\}.$$

Since x, y, z are all infinitesimal and $\frac{\partial f}{\partial x} = 0 = \frac{\partial f}{\partial y}$ at $(0, 0, 0)$, z is infinitesimal of 2d order. Call the 2d D's in order A, B, C and put $x = r\cos\vartheta$, $y = r\sin\vartheta$, where ϑ is the angle with ZX of a normal plane, making a *normal section*, through Z. Hence $\frac{2z}{r^2} = A\,\overline{\cos\vartheta}^2 + 2B\cos\vartheta\sin\vartheta + C\overline{\sin\vartheta}^2 + \}r\}$, hence Lim. $\frac{2z}{r^2} + A\,\overline{\cos\vartheta}^2 + 2B\cos\vartheta\sin\vartheta + C\,\overline{\sin\,\vartheta^2}$, which is easily seen to be the curvature, $\kappa = \frac{1}{\rho}$, of this normal section. For a perpendicular normal section, $\vartheta' = \vartheta + \pi/2$, $\kappa' = \frac{1}{\rho'} = A\,\overline{\sin\vartheta}^2 - 2B\sin\vartheta\cos\vartheta + C\,\overline{\cos\vartheta}^2$; hence $\frac{1}{\rho} + \frac{1}{\rho'} = A + B$, a ***constant*** for all pairs of perpendicular normal sections (Euler), important in Physics and formerly taken as measure of the curvature at $P(0, 0, 0)$.

Consider the surface $2z = Ax^2 + 2Bxy + Cy^2$. It is a ***Paraboloid*** (Pd); it fits on S only at $P(0, 0, 0)$, elsewhere departs from S. The sections of S and Pd are not the same for $z = c$, but close down on each other for $c \doteq 0$. The Pd-section is an ellipse, an hyperbola, or a parabola, according as $B^2 - AC < 0, > 0$, or $= 0$. Suppose it enlarged under the microscope to a constant size as $c \doteq 0$; then the S-section steadily closes down on it as limit.

Hence Pd and S agree ***elementally*** at $P(0, 0, 0)$; also they agree in curvature (of their own normal sections), hence Pd is called the *osculating paraboloid* of S at $(0, 0, 0)$. All these parallel sections, for changing c, are similar, hence $Ax^2 + 2Bxy + Cy^2 = 1$ is taken as type and called *Indicatrix* (Dupin). This indicatrix is an ellipse for $B^2 - AC < 0$, the S is cup-shaped or synclastic; it is an hyperbola for $B^2 - AC > 0$, the S is saddle-shaped (anticlastic), like a mountain-pass. The indicatrix has two Axes, tangents to sections of greatest and least curvature both of Pd and S at P (any point of S) which are mutually perpendicular and named ***principal sections.*** Now let P start to move on S facing along either axis or principal section (say that of least curvature). This axis starts to turn about P. Let P continue to move on S facing always along the turning axis. The tangent to its path will give the direction of this axis at every point of its path, which path is called a *Line of Curvature* (LC). Plainly through every point of S there pass in general two and only two LC's (Monge), each the envelope on S of a system of principal tangents to S. These LC's cut up S into elementary curvilinear rectangles and yield an excellent system of co-ordinates (u, v). If the indicatrix be a circle, then all its axes are principal, through the point P there pass an ∞ of LC's, every normal section is principal, the point P is an ***umbilic*** or *cyclic* point. If the indicatrix be a parabola, then S is edged or ridged (cylindric) at P.

The notion of ***surface-curvature*** is generated and defined quite like that of line-curvature. Draw the normal N to S at every point of the border B of $\Delta S'$, forming a ruled surface, R. Draw parallel to each N a radius of a unit-sphere, forming a cone C cutting out $\Delta S'$, on the sphere-surface, which subtends a (so-called) solid angle Δa at the centre. This we also define as the solid angle of the N's, and further define the ***average curvature*** of ΔS as the ratio $\frac{\Delta a}{\Delta S}$. (Think of a cord passed round the gorge of R and then tightened, compressing R into C without changing the solid angle). If the unit solid angle or stereradian (Halsted) be subtended by r^2, the whole solid angle about centre $= 4\pi$; then the metric numbers of Δa and $\Delta S'$ are equal, hence the curvature of $\Delta S = \frac{\Delta S'}{\Delta S}$, and Lim. $\frac{\Delta S'}{\Delta S} = S_s' = a_s$ instantaneous curvature at P (in ΔS) $= K$.

If R, R' be the principal radii of curvature at any P on S, then $K = \frac{1}{RR'}$; moreover, this K is ***not affected*** by bending S in any way without stretching or tearing — a beautiful Gaussian theorem of profound philosophic import. In this sense, an S that may be flattened out into a plane (a Developable) has 0-curvature; for such, RR' must become ∞; hence either $R = \infty$ or $R' = \infty$. But $RR' = (1 + p^2 + q^2)/(rt - s^2)$, where $p = z_x$, $q = z_y$, $r = z_{xx}$, $s = z_{xy}$, $t = z_{yy}$ (Euler). Hence $rt - s^2 = 0$ is the equation of *Developables.* For *Applicables* and further illustrations, see SURFACES, THEORY OF.

The difficulty in dealing with ***Implicit Functions*** (defined by unsolved equations) lies in the *Existence-theorems*, which can only be stated. I. Let $F(x, y) \neq 0$ at (x_0, y_0), ***and*** have 1st partial D's finite and continuous about (x_0, y_0), *and* $F_y = 0$ at (x_0, y_0): ***then*** there ***is*** a $y = \phi y(x)$ that becomes y_0 for $x = x_0$, and satisfies identically $F(x, y) = 0$ in the vicinity, and is unique, and has a D, $y_x = \phi'(x) = -F_x/F_y$. II. Quite similarly for $F(x, y, z) = 0$, $z = \phi(x, y)$, the last statement being: ***has two partial*** D's. $z_x = -\frac{F_x}{F_z}$, $z_y = -\frac{F_y}{F_z}$; and so on for n variables. Most generally (III) let $F_1, \ldots, F_n$ be n functions of m variables $x, y, \ldots$, and n variables $u, v, \ldots$, all the F's vanishing at $(x_0, y_0, \ldots, u_0, v_0, \ldots)$, all admitting partial D's in that vicinity, and $J(F_1, \ldots, F_n; u, v, \ldots) \neq 0$ (p. 176), at $(x_0, y_0, \ldots, u_0, v_0, \ldots)$: ***then*** there ***is*** a system of functions of m independents $x, y, \ldots$ that become $u_0, v_0, \ldots$ at $(x_0, y_0, \ldots)$, that satisfy identically all the F's in that vicinity, and that have partial D's.

Hence we have as the ordinary rule for finding y_x from $F(x, y) = 0$: Differentiate F as to x regarding y as a function of x, as in mediate derivation, and solve the result as to y_x.

To find now ***maximum*** or ***minimum*** y in $F(x, y) = 0$, we have $y_x = 0$, $\therefore F_x = 0$; also, therefore, $F_{xx} + F_y \cdot y_{xx} = 0$. If $F_y \neq 0$, there is *maximum* for F_{xx} and P_y *like-signed, minimum* for F_{xx} and F_y *unlike-signed,* and no determination for $F_{xx}=0$.*

Often we seek (so-called) *relative maximum* and *minimum* of $z=f(x, y)$ when $F(x, y)=0$. The former equation is a surface S, the latter an intersecting surface determining a path over S,—we seek the peak and valley points in this path. Differentiating we find as the prime condition, $f_x . F_y - f_y . F_x = 0 = J(f, F; x, y)$, from which and $F=0$ we find the x and y that maximize or minimize f.

More generally we seek *maximum* or *minimum* of a function of $(m+n)$ variables, $f(x, y, \ldots u, v, \ldots)$, under n conditions $F_1(x, y, \ldots u, v, \ldots)=0, \ldots F_n(x, y, \ldots u, v, \ldots)=0$. Theoretically we might eliminate n variables $u, v, \ldots$ leaving the other m independent; it is better to let them remain considered as functions of the m independents, $x, y, \ldots$ Hence, on putting each partial $D=0$, we get m equations which, with the n $F_1=0, \ldots F_n=0$, form $(m+n)$ equations for finding $(m+n)$ unknowns $x, y, \ldots u, v, w, \ldots$ To discriminate between maximum and minimum by the sign of d^2f will now be tedious, but often geometrically or mechanically unnecessary.

Swifter and simpler is Lagrange's 'Method of Multipliers.' We form a new function, $\phi(x, y, \ldots u, v, \ldots)=f(x, y, \ldots u, v, \ldots) - \Sigma\lambda F(x, y, \ldots u, v, \ldots)$. Only so long as each $F=0$ will $\phi=f$ identically for all values (under consideration) of the variables. We now determine these λ's so as to make vanish simultaneously all the partial D's of ϕ as to $x, y, \ldots u, v, \ldots$ The n conditions are rolled off from the $u, v, \ldots$ upon the n λ's. We may proceed similarly in dealing with *Envelopes,* where $(n+1)$ parameters are connected by n conditions.

Transformation of Variables is often necessary, like transformation of Co-ordinates. The formulæ, simple at first, soon become highly complicated and we are led into the *Theory of Substitutions, Invariants, Reciprocants* and the like, which cannot be treated here.

Integration.—As the Differential Calculus is the doctrine of Limits of Quotients of Simultaneous Infinitesimal Differences, so the INTEGRAL CALCULUS is the doctrine of Limits of the Sums of Infinitesimal Products that increase in number while decreasing in size, both indefinitely. The type is the quadrature of an area (A) bounded by X, a curve $y=f(x)$, and two end-ordinates, $x=a$ and $x=b$. Cut it into n strips, ΔA, standing each on a Δx; their sum is A; plainly $Y\Delta x > \Delta A > y\Delta x$, Y being the greatest, y the least, ordinate standing on its own particular base Δx. Since $\Sigma\Delta x = b-a$, if $y=f(x)$ be continuous, finite, one-valued throughout $[a, b]$, each $Y-y$ is an ϵ, hence $\Sigma(Y-y)\Delta x < \epsilon\Sigma\Delta x$, or $<(b-a)\epsilon$; hence Lim. $\Sigma(Y-y)\Delta x=0$. Hence A is the common limit of every $\Sigma y\Delta x$, written $\int_a^b y\,dx$, named *Definite Integral* (*DI*) of $f(x)$ (the *Integrand*) as to x, between the *extremes* (end-values) a and b. The total sign of Integration is $\int\ldots dx$ or $\int_x$, $\int$ being an extended S, meaning *Limit of Sum.*

Plainly, exchanging extremes (a and b) merely reverses the integral by reversing Δx, $\int_b^a = -\int_a^b$. Also $\int_a^b = \int_a^c + \int_c^a$, $f(x)$ being supposedly integrable throughout, from a to b, and to c. Also $\int c\phi x dx = c\int\phi(x)dx$. Also $\int_a^b f(x)dx = \int_{a\pm c}^{b\pm c} f(x\pm c)d(x\pm c)$,—a mere change of origin. Also $\int[\phi(x)\pm\phi(x)]dx = \int\phi(x)dx \pm \int\phi(x)dx$. We easily prove the almost obvious *Theorem of the Mean*: If $f(x)=\phi(x)\cdot\phi(x)$, each factor integrable, and $\phi(x)$ always of same sign, in $[a, b]$, then $\int_a^b \phi(x)\,\phi(x)\,dx = \phi(\bar{x})\int_a^b \phi(x)dx$, $\bar{x} \equiv a+\theta(b-a)$. Hence $I_b = f(b)$, $I_a = -f(a)$, where the D is again the *front of variation* of the Integral I or Area A.

Hence we readily reckon many integrals as:

$$\int_a^b x^n dx = \frac{b^{n+1}}{n+1} - \frac{a^{n+1}}{n+1} = \left\{\frac{x^{n+1}}{n+1}\right\}_a^b,\ n \text{ a pos. int.};$$

$$\int \cos x\,dx = \left\{\sin x\right\}_a^b, \int_a^b \sin x\,dx = \left\{-\cos x\right\}_a^b,$$

$$\int_a^b \sqrt{r^2-x^2}dx = \frac{1}{2}\left\{x\sqrt{r^2-x^2}+r^2\sin^{-1}\frac{x}{r}\right\}_a^b,$$

This is seen at once from the figure (circle-quadrant), as also

$$\int_a^b \sqrt{r^2+x^2}dx = \tfrac{1}{2}\left\{x\sqrt{r^2+x^2}+r^2hs^{-1}\frac{x}{r}\right\}_a^b,$$

seen from $y^2-x^2=r^2$. We perceive that the $f(x)$ is always the D of the so-called *Indefinite Integral,* the expression to be evaluated at b and a. This is easily proved variously to be always the case. Thus, if $f(x)=\phi'(x)$ for x in $[a, b]$, then $\}I-\phi(b)\{_b = f(b)-\phi'(b)=0$, for every value of b in the range of Integrability. Hence $I-\phi(b)=C$. For $b=a$, C is found to be $=-\phi(a)$; hence,

$$I \equiv \int_a^b \phi'(x)dx = \phi(b)-\phi(a).$$

Hence, to calculate the integral of any integrand from a to b, find the function of which the integrand is the D, and take the difference of its values at b and a. The D of the integral is the integrand, *so far as form goes,* but the *value* depends on the extremes. Since b may be any x in the range of integrability, it is common to write it x, using x in double sense, not necessarily confusing. So long as a is unassigned, C is undetermined; hence it is common to omit a and write $\int^x f(x)dx = \phi(x)+C$, where under $\int$ we may put z or any other symbol for x. The integral depends for its *form* solely on f; for its *value*, on a and b also.

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* From foregoing sections it is seen that, to max- *resp.* minimize z a function of independent x and y, we must have, as first condition, $z_x = 0 = z_y$; and similarly for any number of independents. The secondary conditions are too complicate for discussion here.

Hence *integration* and *derivation* or *differentiation* are *inverse operations* and $\int = D^{-1}$, $D = \int^{-1}$. The direct D yields a definite result, the inverse $\int$ yields a result definite only as to *form*, up to an *additive constant*, C. (Cf. Evolute and Involute, above). Derivation simplifies, reducing even transcendents to algebraics; Integration complicates, lifting algebraics and even rationals up into transcendents $\left(\text{as } \sqrt{a^2 - x^2} \text{ and } \frac{1}{x}\right)$. Derivation is deductive and can create no new forms. Integration is inductive and creates an ∞ of new forms, all defined as integrals.

Operating directly on $y = f(x)$ by a series of differentiations as to x, say $\phi(D)$, we get some function of x, as X, or $\phi(D)y = X$. If we know X and ϕ, we may seek that $y \equiv f(x)$ that will yield X on being subjected to the train of operations $\phi(D)$; i.e., we seek to *invert* at once the totality of operations $\phi(D)$, so that $y = \frac{X}{\phi(D)} = \phi^{-1}(D)X$. This inversion is solving the *Differential Equation* $\phi(D)y = X$, and is perhaps the most profound of mathematical operations, of immense and even unconquerable difficulty, overcome as yet only in special cases. Thus $x^2 \frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 4y = 2x^2$, where $\phi(D) \equiv x^2D^2 - 3xD + 4$, yields, as result of the inverse $\phi^{-1}(D)$ or $\frac{1}{\phi(D)}$,

$$y = x^2(A + B\log x + \overline{\log x}^2),$$

where A and B are arbitrary constants. Other forms of $\phi(D)$, quite as simple, yield far higher transcendents.

Inverting a table of elementary D's we get a table of *elementary Integrals*. The art is to *reduce* other forms, if possible, to these elementary forms; when impossible, we must introduce transcendents *defined by integrals*.

Change of Variable is the most fruitful method of Reduction. By mediate derivation, $D_x\phi(u) = \phi'(u) \cdot u_x$; also $D_u\phi(u) = \phi'(u)$; hence $\int \phi'(u)du = \phi(u) = \int \phi'(u) \cdot u_x \cdot dx$. In this 2d $\int$, all is supposed expressed through x. Hence, to pass from an *old to* a *new* variable of integration, multiply by the D of the *old* as to the *new*, or divide by the D of the *new* as to the *old*; i.e., under the $\int$ sign,

$$du = u_x \cdot dx,\ dx = \frac{du}{u_x}.$$

Of course, the extremes must be properly adjusted.

Integration by parts is also a powerful reductive process. From $(uv)_x = u_xv + uv_x$ we have $uv = \int u_xvdx + \int uv_xdx$, or $\int uv_xdx = uv - \int u_xvdx$. This latter $\int$ may be simpler, or may return into the first, or other advantages may accrue. Thus $\int \cos x . \cos x \cdot dx = \sin x \cdot \cos x + \int \overline{\sin x}^2 \cdot dx$ $= \sin x \cdot \cos x + x - \int \overline{\cos x}^2 dx$; whence $2\int \overline{\cos x}^2 \cdot dx = x + \sin x \cdot \cos x$. Similarly for any integral power of sine or cosine except $(\sin x)^{-1}$, $(\cos x)^{-1}$, which are reduced by passing to the half-angle, $\frac{x}{2}$.

What is the range of such reductions? *What functions can we thus integrate in terms of known functions?* Few enough. Of *Algebraics*,

I. *Rational functions*, $\frac{\phi(x)}{\phi(x)}$, by decomposition into part-fractions.

II. *Rational functions* of x and $\left(\frac{ax+b}{cx+d}\right)^{a/\beta}$ $\left(\frac{ax+b}{cx+d}\right)^{a'/\beta'}$, . . . Put $\frac{ax+b}{cx+d} = u^m$, m being L.M.C. of $\beta, \beta', \ldots$. Herewith the $\int$ becomes rational in u.

III. *Rational functions* of x and $\sqrt{ax^2+2bx+c}$.

If we think of $y^2 = ax^2+2bx+c$ as a conic, and $y - \beta = u(x - a)$ as a secant through a point (a, β) of the conic, then we may express both x and y rationally through u, which reduces this case to I; (a, β) may be taken variously. Generally we bring y^2 to the form of sum or difference of two squares by putting $x = z + h$.

IV. *Rational functions* of x and y, these being co-ordinates of a *unicursal* $F(x, y) = 0$. We shall then have $x = \phi(u)$, $y = \phi(u)$, where ϕ and ϕ are rational, whereby these Abelian Integrals reduce to I.

The binomial $x^m(a+bx^n)^p$ can be reduced to II, and hence integrated, not generally, but in these important cases, by putting $u = x^n$.

1. p integral; if $\frac{m+1}{n} = \frac{r}{s}$ (r and s integers), put $\sqrt[s]{u} = z$.
2. $\frac{m+1}{n}$ integral; if $p = \frac{r}{s}$ (r and s integers), put $\sqrt[s]{a+bu} = z$.
3. $\frac{m+1}{n} + p$ integral; if $p = \frac{r}{s}$ (r and s integers), put $a+bu = nz^s$.

If $f(x)$ be rational in x, $\sqrt{ax+b}$, $\sqrt{cx+b}$, put $ax+b = v^2$, which reduces it to 3.

Of Transcendentals.—1. *Rational functions* of $\sin x$ and $\cos x$. Put $u = \tan\frac{x}{2}$, a very important substitution.

2. *Rational functions* of e^{ax}. Put $u=e^{ax}$.

3. *Rational Integral functions* of x, e^{ax}, e^{bx}, … sin mx, sin nx, …, cos mx, cos nx, … Express the sines and cosines through imaginary exponentials. In the result express the imaginaries through sines and cosines. Here are included rational functions of the *hyper-sine and -cosine.*

4. *Rational Integral functions* of x and log x, or x and $\sin^{-1}x$. Put $x=e^u$, or $x=\sin u$.

If $f(x)=R(x,\sqrt{T})$, T of 3d or 4th degree in x, we cannot rationalize but must introduce *Higher Transcendents.* Let

$$u=\int_x^\infty \frac{dx}{\sqrt{T}}=\int_x^\infty \frac{dx}{\sqrt{4(x-e_1)(x-e_2)(x-e_3)}}.$$

Here x and u are functions of each other and it seems natural to take u as function, x as argument; but in $I=\int\frac{dx}{\sqrt{1-x^2}}=\sin^{-1}x$, $x=\sin I$ is a much simpler (periodic) function of I than I is of x; hence we may suspect that x above is a simpler (periodic?) function of u than u of x. Hence Abel thought the theory might be simplified by inverting the dependence before him assumed—one of the greatest divination in mathematical history. We write $x=\wp(u)$ (Weierstrass), $u=\int_{\wp(u)}^\infty\frac{dx}{\sqrt{T}}=\wp^{-1}(x)$.

Hence $u_\wp=-\frac{1}{\sqrt{T[\wp(u)]}}$ and so on. Now just as sine and cosine have *one* period 2π, so $\wp$ has *two* periods, 2ω and $2\omega'$, it is an *Elliptic* or *Doubly periodic function.* The Theory of such Functions, one of the most august creations of the last century, is conspicuous in Analysis. Of Hyper-elliptic Integrals there is no space to speak.

The integral of an Infinite Series may be found by integrating term by term *only when* the series converges uniformly within an interval comprising the extremes of the integration.

It is seen that the integrable forms are absolutely many, relatively few, the integration generally giving rise to a *new function.*

Thus far we have raised no question as to *Integrability,* the Integrand being supposed unique, continuous, finite and therefore integrable, in $[a, b]$. But when, if ever, may we let one or more of these conditions fall? As to continuity, Riemann has discussed profoundly, ***In what cases is a function integrable, and in what not?*** and still further precision has been attained by Du Bois Reymond and Weierstrass.[*] It is of particular interest to know whether $\Sigma y\Delta x$ will vary finitely with varying modes of divisions of $[a, b]$. Riemann calls the subintervals $\delta_1, \delta_2, \ldots \delta_n$; the greatest fluctuation of function-value in each δ_k he calls D_k; then must $\Sigma\delta_k D_k$ *be infinitesimal.* Thence it follows that when, as each δ_k sinks indefinitely toward 0, the sum of subintervals, in which D is $>\sigma$, itself is infinitesimal, *then* the Sum Σ has a definite limit, the same however $[a, b]$ be subdivided. Hence the integral $I=\underset{\delta_k \doteq 0}{L}\sum_{k=0}^{k=n\doteq\infty} f(x_k)\,\delta_k=\int_a^b f(x)\,dx$ *exists* when $f(x)$ is finite and unique in $[a, b]$, and when for every infinitesimal positive ϵ there is also a positive δ such that $|\Sigma - I|<\epsilon$ when each $\delta_k<\delta$.

Plainly such is the case (1) for $f(x)$ *continuous throughout* $[a, b]$; but also (2) when $f(x)$ is finitely discontinuous at a finite number of points in $[a, b]$, and when $f(x)$ has an ∞ of maxima and minima, or is quite undetermined (though finite) at a finite number of points in $[a, b]$, as $\sin\frac{1}{(x-1)(x-2)}$ at 1 and 2; (3) even when $f(x)$ is *discontinuous* or *finitely indeterminate* at an ∞ of points and has an ∞ of maxima and minima in the vicinity of an ∞ of points, provided only all these points of finite function-fluctuation form *not a linear* but only a *discrete mass of points* (Punktmenge)—the function is then said to be only *point wise* (punktirt) *discontinuous* (Hankel).—A *discrete mass* or manifold of points is an ∞ of points in a finite interval $[a-h, a+h]$, so distributed at subintervals that the *sum* of these subintervals may be made small at will by enlarging at will the number of subintervals. Otherwise, the mass is *linear.* Functions *linearly discontinuous* are *not* integrable. For Cantor's more comprehensive theory of Derived Masses ('Math. Ann.,' XVII, 358*f*), see *Assemblages.*

Du Bois Reymond has shown ('Jour. f. d. r. u. d. a. Math.,' 79, 21*f*) that the *product* of two such integrable functions is itself integrable.

Thus far the integrand has been *finite.* But the DI $\int_0^1\frac{dx}{\sqrt{1-x^2}}=\pi/2$, *although* the integrand $=\infty$ at 1. In general, if $f(x)$ be ∞ or discontinuous, or oscillatory at $x=c$ in $[a, b]$, then $\int_a^b f(x)\,dx$ loses meaning; but if the sum $\int_a^{c-\alpha} f(x)\,dx+\int_{c+\beta}^b f(x)\,dx$ nears a definite limit no matter how α and β approach 0 indefinitely, then this limit is named *value of* $\int_a^b f(x)\,dx$. Such is the case only when $\int_{c-\alpha}^{c-\alpha'} f(x)\,dx$ and $\int_{c+\beta}^{c+\beta'} f(x)\,dx$ converge *each* toward 0, as α, α', β, β', all close down on 0, $\alpha'<\alpha$, $\beta'<\beta$; i.e., the immediate neighborhood of c must contribute infinitesimally to the integral. Similarly for any number of points not forming a *linear mass.*

So, too, we may let either *extreme,* as b, increase toward ∞ if only the total contribution of the infinitely remote region be infinitesimal, i.e., if $\int_{b'}^b f(x)\,dx<\sigma$ for b however large, b' being *first* taken sufficiently large.

Double Integrals. $\int\int f(x,y)\,dx\,dy$.—Think of a finite region R in XY, at each point of which is erected a perpendicular z, all forming a cylindric volume (V) bounded by XY, the surface

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[*] For yet greater refinement and generalisation, see *Lebesgue*, 'Annali di Matematica', (259f, 1902).

$z=f(x, y)$, and the cylindric surface standing on the border (B) of R. To find V we may cut up R into elements (ΔR), as by parallels to X and Y, and V into elementary cylinders (ΔV) on these elementary bases. Plainly $V=L\Sigma f(x, y)\,\Delta R=\int f(x, y)\,dR$. Here we assign no extremes to R, the integration stretches over all of R, so that B corresponds to the extremes of simple integration. It is and must be indifferent in what order the elements ΔR are taken; hence we may sum up first along a strip parallel to X, and then sum all such strips along Y. This double summing is expressed by a *Double Integral* (II) thus:

$$L\,\Sigma[\Sigma f(x, y)\Delta x]\Delta y=\int_a^\alpha\int_b^\beta f(x, y)\,dx\,dy.$$

Here for any value of x the values of y are determined by the equation of B. Hence b and β are functions of x; but a and α depend on the extreme parallels to Y tangent to B, hence are absolute constants.

It is geometrically clear that II is perfectly *definite*, but we must ask in default of Geometry, when does Σ approach the *same* limit independently of the function-value chosen for each ΔR and the way in which each $\Delta R \doteq 0$, as their number $\doteq \infty$? Answer: When $\Sigma D_k.\Delta R_k \doteq 0$ as each $\Delta R_k \doteq 0$, D_k being the greatest fluctuation in function-value in ΔR_k. When is this the case? Answer: (1) When $f(x, y)$ is continuous throughout R: (2) when f at single points or on single lines (at ∞^1 points) becomes finitely discontinuous or indeterminate or oscillatory; (3) when f becomes thus finitely discontinuous or indeterminate or oscillatory along an ∞ of lines (at ∞^2 points), *if only* the sum of the elements (ΔR's), where $D>\sigma$, is itself $<\varepsilon$ (infinitesimal); i.e., when the linear masses do *not* form an areal (or planar) mass, i.e., when their initial elements form not a linear but only a discrete mass.

May $f(x, y)$ attain ∞ and II retain sense? Answer: If f attains a definite ∞ but only at definite points, or along a curve and of order <1, then the II remains definite and finite; also the order of integration remains indifferent. Here the contribution, to the II, $\doteq 0$ as the element of area (in XY) shrinks toward 0 along the curve; i.e., the volume V shoots up to ∞ only along an infinitely sharp edge.

So, too, the *region* R may stretch out any way toward ∞ if f shrinks faster than R spreads; e.g., R may spread over all the plane, if in all remote regions f becomes 0 of higher than 2d order. Minuter discussion must be foregone.

Extremely important is the *change of variables* in II. In simple integration $du=u_x dx$ under the $\int$, whereby we pass from x to u as variable of integration. In passing from x, y to u, v, under the $\int\int$, $du\,dv=M\,dx\,dy$, but what is M? It is $\frac{\partial u}{\partial x}\cdot\frac{\partial v}{\partial y}-\frac{\partial u}{\partial y}\cdot\frac{\partial v}{\partial x}=\begin{vmatrix} u_x & v_x \\ u_y & v_y \end{vmatrix}=\frac{\partial(u, v.)}{\partial(x, y)}=J(u, v; x, y)$. This remarkable expression, introduced by Jacobi and named by him the *Functional Determinant*, is called the *Jacobian* (Salmon). As already exemplified, it plays the rôle of *derivative of the system* (u, v) *as to* (x, y). In fact $\frac{\partial(u, v)}{\partial(x, y)}\cdot\frac{\partial(x, y)}{\partial(u, v)}=1$ just as $\frac{du}{dx}\cdot\frac{dx}{du}=1$. Also $\frac{\partial(u, v)}{\partial(x, y)}=\frac{\partial(u, v)}{\partial(w, z)}\cdot\frac{\partial(w, z)}{\partial(x, y)}$, as $y_x=y_u.u_x$. Again, if $\frac{du}{dx}=0$, then $u=c$; so, if $\frac{\partial(u, v)}{\partial(x, y)}=0$, then $F(u, v)=c$, and so on.

From DI we readily pass to the *triple I*, $\int_a^{a'}\int_b^{b'}\int_c^{c'} f(x, y, z)\,dx\,dy\,dz$, and hence to *multiple I*'s in general. The higher Jacobian maintains its rôle: $du\,dv\,dw=J\,dx\,dy\,dz$, $J=\frac{\partial(u, v, w)}{\partial(x, y, z)}=\begin{vmatrix} u_x & u_y & u_z \\ v_x & v_y & v_z \\ w_x & w_y & w_z \end{vmatrix}$; and so on in general.

Thus, to pass from rectangular to polar co-ordinates, $x=\rho\cos\vartheta$, $y=\rho\sin\vartheta$; $J(x, y; \rho, \vartheta)=\rho$; under $\int\int$, $dx\,dy=\rho\,d\rho\,d\vartheta$—this latter is in fact the elementary curvilinear rectangle.—To pass from rectangular to spherical co-ordinates, $x=\rho\cos\vartheta\sin\phi$, $y=\rho\sin\vartheta\sin\phi$, $z=\rho\cos\phi$, whence $J(x, y, z; \rho, \vartheta, \phi)=\rho^2\sin\phi$, and $\rho^2\sin\phi\,d\rho\,d\vartheta\,d\phi$ is in fact the rectangular curvilinear volumetric element under $\int\int\int$. Analogy readily extends these forms to n-fold spaces. Thus the Jacobian appears geometrically as a real *derivative*, the limit of the ratio of two simultaneous changes.

The single $\int_a^b f(x)dx=F(b)-F(a)$, where $f=F'$ expresses the sum-value of f, integrated along the length $b-a$, through the *end-values* of some F at b and a; can the double $\int\int f(x, y)\,dx\,dy$ integrated over the region R also be expressed through the *end-values* of some $F(x, y)$ along the contour of R? This query is much harder to answer, but is answered similarly: If $f(x, y)$ is integrable in R, then in general $\int^x f(x, y)dx$ is for every included value of y a continuous function of x, $F(x, y)$, and for every included value of x an integrable function of y. Then the DI $\int\int f(x, y)\,dx\,dy=\int F(x, y)\sin v\,ds$, where s is the contour of R and $v=$ slope of the normal (drawn inwards at any point of s) to the $+Y$-axis. This latter is a curvilinear $\int$, geometrically depicted as a wall built up (*resp.* down) along the contour s of R.—

Similarly a $\int\int\int$ of f extended throughout a volume (or three-wayed spread) may be expressed through the end-values of a certain F integrated over the entire surface (S) of the volume, whereby a space-integral is turned into a surface-integral and conversely:

$$\int\int\int\left(\frac{\partial\phi}{\partial x}+\frac{\partial\phi}{\partial y}+\frac{\partial x}{\partial z}\right)dx\,dy\,dz =$$

$$\int\int\left(\phi\frac{\partial n}{\partial x}+\varphi\frac{\partial n}{\partial y}+\chi\frac{\partial n}{\partial z}\right)dS,$$

where Δn along the normal to S corresponds to Δx on X, etc. These conversions (of Green and Riemann) are equally important to pure and to applied mathematics.

The most immediate geometric problem of integration is *Quadrature,* already discussed. *Rectification* is finding in a straight-length = an arc-length. This latter must be *defined* as the *common limit* of the length of inscribed and circumscribed polygons of which each side $\doteq 0$.

Since $s_t = \sqrt{(x_t)^2+(y_t)^2}$, $s = \int\sqrt{(x_t)^2+(y_t)^2}\,dt$.

If now $x=\phi(t)$, $y=\phi(t)$, be continuous functions of t, with finite limits of value, then this integration is possible, and the curve is *rectifiable.* Such is not the case in Weierstrass's curve; there the oscillations (maxima and minima) are infinitely many in every neighborhood however small, nor is the variation finite in any such neighborhood — the arc is infinite between any two points.

Volume is given by triple Integration, $\int\int\int dx\,dy\,dz$, extremes defined by the bounding surface. Often the area of a section perpendicular (or possibly oblique) to an axis, as X, is a function of x, ${}_xS=f(x)$; then $V=\int {}_xS dx$. In the important case of *Revolutes* (of an area bounded by X, the curve, and two y-ordinates), ${}_xS=\pi y^2$, $V=\pi\int y^2dx$.

Quadrature of a curved surface is sometimes called *Complanation.*

Here again the area must be defined as the common limit of the surface area of polyhedra inscribed and circumscribed, no matter how. The surface element dS or (ΔS) about P may be viewed as projected into the element $dx\,dy$ in XY and as having a limiting ratio 1 with the corresponding element $\Delta\Pi$ in the plane tangent at P. The slope of this plane to $XY=\gamma=$ slope of normal to Z; Hence $\text{Lim.}\frac{\Delta S}{\Delta x\Delta y}=\text{Lim.}\frac{\Delta S}{\Delta\Pi}\cdot\frac{\Delta\Pi}{\Delta x\Delta y}=\text{Lim.}\frac{\Delta\Pi}{\Delta x\Delta y}=$ $\sec\gamma=\{F_x^2+F_y^2+F_z^2\}\,\tfrac{1}{2}/F_z$; hence $S=\int\int\{\quad\}\,\tfrac{1}{2}/F_z dx\,dy$, the region of integration in XY being the projection thereon of S, under obvious conditions. Often the surface is given *parametrically,* i.e., x, y and z as functions of the independents, u and v. Then we write off the rectangular array $\left\|\begin{matrix}x_u & y_u & z_u\\ x_v & y_v & z_v\end{matrix}\right\|$, and form therefrom the three Jacobians, by deleting the columns in order, commonly written A, B, C. Hence, by easy substitution for F_x, F_y, F_z, $S=\int\int\sqrt{A^2+B^2+C^2}\,du\,dv$*. To every point (x, y, z) of S there is co-ordinated a point (u, v) of a plane.

For Revolutes, $S=2\pi\int y\,ds$.

Differentiatio de Curva in Curvam.— We have found the D of an $\int$ as to either extreme, but the integrand may contain a *parameter,* thus $\int f(x;p)dx$. The $\int$, being then a function of f, is also a function of p and may be differentiated as to p, giving rise to *Parametric Derivation.* Thus, $I=\int_a^b e^{px}dx=\left\{\frac{1}{p}e^{px}\right\}_a^b$; hence $I_p=\left\{\frac{px-1}{p^2}e^{px}\right\}_a^b$. If now we differentiate the integrand first, and then integrate, we obtain the same result. Hence the order Integr.${}_x$ Der.${}_p$ is equivalent to Der.${}_p$ Integr.${}_x$ This holds generally, if for a definite interval $[p, p+\Delta p]$, and for $[a, b]$, $\frac{\partial f(x,p)}{\partial p}$ is in general (with possible exception of only discrete masses of points) a continuous function of both x and p; *then* $\frac{\partial}{\partial p}\int_a^b f(x, p)dx=\int\frac{\partial f(x,p)}{\partial p}dx$. If p appears in either a or b or both, then

$$\frac{\partial}{\partial p}\int_a^b f(x,p)dx$$

$$=f(b,p)\frac{db}{dp}-f(a,p)\frac{da}{dp}+\int_a^b\frac{\partial f(x,p)}{\partial p}dx.$$

If the $\int_a^b$ be an integrable function of p, $F(p)$, in $[\alpha, \beta]$, integrating as to p we get $\int_\alpha^\beta\left\{\int_a^b f(x,p)dx\right\}dp=\int_\alpha^\beta F(p)dp$, and the order of integration is indifferent while f is a continuous function of both x and p.

Thus the $\int_a^b$ may be treated as function of any parameter in f, when the extremes are constant, as 0, 1, $\pm\infty$, and this gives rise to an important set of concepts and to the *Theory of Definite Integrals.* Thus, for $0<a<1$, $\int_0^\infty\frac{x^{a-1}}{x+1}dx=\frac{\pi}{\sin a\pi}$, and is a function of a. Among such the *Eulerians* are conspicuous, especially that of 2d species (Legendre), $\int_0^\infty x^{a-1}e^{-x}dx$, denoted by $\Gamma(a)$, or better by the Gaussian $\Pi(a-1)$, through which countless others are expressible. This Γ-or-Π-function has remarkable properties:

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*Also $S=\int\int\sqrt{EG-F^2}\,du\,dv$, $E=x_u^2+y_u^2+z_u^2$, $G=x_v^2+y_v^2+z_v^2$, $F=x_u\cdot x_v+y_u\cdot y_v+z_u\cdot z_v$ (Lagrange).

1. $\Gamma(a+1)=a\Gamma(a)$, or $\Pi(a)=a\Pi(a-1)$,—the factorial property, $\underline{|n}=n\underline{|n-1}$. But the factorial loses its meaning if n is not a positive integer, while Γ and Π retain theirs: thus, $\Gamma(\frac{1}{2})=\sqrt{\pi}$, $\Gamma(\frac{5}{2})=\frac{3}{2}\cdot\frac{1}{2}\sqrt{\pi}$.

2. $\Gamma(a)\,\Gamma(1-a)=\frac{\pi}{\sin a\pi}$, Euler's beautiful discovery. Hereby arguments complemental to 1 are set in mutual relation, as $\sin(\pi-a)=\sin a$, $\tan a\cdot\tan\left(\frac{\pi}{2}-a\right)=1$, so that from $\Gamma(\frac{3}{4})$ we may reckon $\Gamma(\frac{1}{4})$. Hence we need reckon $\Gamma(a)$ only for a in $[0, \frac{1}{2}]$, as sin a only for a in $[0, \pi/2]$.

$\Gamma(a)$ and particularly log $\Gamma(a)$ may now be differentiated with highly interesting results, as $\frac{d^2\log\Gamma(a)}{da^2}=\sum_{n=0}^{n=\infty}\frac{1}{(a+n)^2}$. This Σ is uniformerly convergent for $a>0$; hence we may integrate term-wise from 1 to a and get $\frac{d\log\Gamma(a)}{da}=(a-1)\sum_{n=0}^{n=\infty}\frac{1}{(1+n)\,(a+n)}+C$, where C is the Eulerian or Mascheronian Constant $\equiv\frac{\Gamma(1)'}{\Gamma(1)}=\Gamma(1)'=.5772156649\ldots$ calculated by Euler to 15 and by Legendre to 19 decimals.

Hence, by a 2d Integration,

$$\log\Gamma(a)=\sum_{m=1}^{m=\infty}\log\frac{m\left(\frac{m+1}{m}\right)^{a-1}}{a+m-1},$$

$$\Gamma(a)=\prod_{m=1}^{m=\infty}\frac{m\left(\frac{m+1}{m}\right)^{a-1}}{a+m-1}$$

$$=\frac{m(m+1)^{a-1}}{a(1+a)\left(1+\frac{a}{2}\right)\ldots\left(1+\frac{a}{m-1}\right)}$$

$$=\frac{(m+1)^{a}}{a(1+a)\left(1+\frac{a}{2}\right)\ldots\left(1+\frac{a}{m-1}\right)},\ (m\doteq\infty).$$

Such is Gauss's *Definition of* $\Gamma(a)$ for every finite a for which no factor in the denominator vanishes. Herewith we are brought to the expression of functions not through infinite series but through infinite *products*, as already exemplified in Wallis's formula:

$$\frac{\pi}{2}=\frac{2}{1}\cdot\frac{2}{3}\cdot\frac{4}{3}\cdot\frac{4}{5}\cdot\frac{6}{5}\cdot\frac{6}{7}\ldots$$

This subject, of infinite range, cannot be pursued here—"hills peep o'er hills, and Alps on Alps arise." The fundamental theorems were rigorously proved first by Weierstrass (Jour. f. d. r. u. d. a. Math., LI). It may be added that the 1st Eulerian, $\int_0^\infty\frac{x^{a-1}}{(1+x)^{a+b}}dx$, is denoted by $B(a, b)$ (Binet) and is connected with the 2d by $B(a, b)\Gamma(a+b)=\Gamma(a)\cdot\Gamma b$, and being expressible thus simply through Γ has not so much independent significance.

The central notion of the *Integral Calculus*, the LIMIT of a SUM, is more obvious than that of the *Differential Calculus*, the LIMIT of a QUOTIENT. The foundations of the one are also seen to be much broader than those of the other, so that the former is *not merely* the inverse of the latter. The twain seize upon the two great aspects of History, the Dynamical and the Statical, Process and Result. While the Integral Calculus borrows its speed and directness from the Differential Calculus, its own reaction upon this latter is instant and powerful. Thus, from integration by parts we have

$$\int\phi'(y)dy=y\phi'(y)-\int\phi''(y)ydy;\ -\int\phi''(y)ydy$$

$$=-\frac{1}{\underline{|2}}y^2\phi'(y)+\frac{1}{\underline{|2}}\int\phi'''(y)y^2dy;\ \text{and so on.}$$

Evaluating between the extremes 0 and h we get **Bernouilli's Series (with Remainder)**;

$$\phi(h)=\phi(0)+h\phi'(h)-\frac{h^2}{\underline{|2}}\phi''(h)+\frac{h^3}{\underline{|3}}\phi'''(h)-\ldots$$

$$\pm\frac{1}{\underline{|n}}\int_0^h y^n\phi^{(n+1)}(y)dy.$$

To avoid the alternation in sign we take $\int\phi(a-u)du$ and proceed as before: then on putting $a=x_0+h$,

$$\phi(x_0+h)=\phi(x_0)+h\phi'(x_0)+\frac{h^2}{\underline{|2}}\cdot\phi''(x_0)+\ldots$$

$$+\frac{1}{\underline{|n}}\int u^n\phi^{n+1}(x+h-u)du,\ 0<h<R.$$

Such is the swiftest, directest, nearest-lying deduction of the fundamental *Taylor's Series*, by which the value of ϕ at (x_0+h) is built up out of the value of ϕ and its D's at x_0. The R_n is here yielded as a definite integral, from which form the other forms, as Lagrange's, Cauchy's, Schlömilch's, come at once on applying the Maximum-Minimum Theorem. This development holds under the two necessary and sufficient conditions (Pringsheim):

1. That $\phi(x)$ possess everywhere in $[x_0, x_0+R]$ definite finite differential coefficients of every finite order;

2. That Lim. $\frac{1}{\underline{|n}}\phi^{(n)}(x_0+h)\cdot k^n$ converge uniformly on 0 (for $n=\infty$, for all pairs (h, k) for which $0\leqq h\leqq h+k<R$.

The Infinitesimal Analysis or Method of Limits is very highly developed and is applicable to almost every subject of exact thought, often asserting itself in the most surprising fashion, as in the *Theories of Numbers* and of *Knots*, to which it might seem wholly alien, suddenly unlocking and laying wide open secret passages utterly unsuspected. In particular the Integral Calculus shows itself amazingly and unendingly fertile in the generation of new notions. As other and still other fields are exposed to investigative thought, the Calculus will receive more and more applications, and there seems to be no limit to the subtlety and refinement of its processes, to the keenness and penetration that may be given to this two-edged sword of the spirit, the strongest, sharpest and most flexible ever fashioned or wielded by the mind of man.

Historical Sketch.— Passing by anticipations, especially of Integration, that reach back at least to Archimedes (287–212 B.C.), we come to Barrow's 'Lectiones opticæ et geometricæ'

(1669–70), on which *Newton* collaborated, how much no one knows. Barrow used the Differential Triangle even in 1664 (indefinite parvum, . . . ob indefinitam curvæ parvitudinem), calling Δy *a* and Δx *e* (as Fermat used *A* and *E*, 1638). Newton was busied with Series at Cambridge, 1665–66 (eo tempore pestis ingruens coegit me hinc fugere — in his famous letter, filling 30 pages in the *Opuscula,* to Oldenburg, secretary of the Royal Society, 24 Oct. 1676). His MS. ‘De analysi per æquationes numero terminorum infinitas’ (partially published first in Wallis's Works, Vol. II, 1693) was shown to Barrow, Collins, Lord Brouncker in 1669, wherein he used *o* for a magnitude ultimately vanishing, as had James Gregory already in his ‘Geometriæ pars universalis’ (1667, Venice). He treated Rectification, Cubature and Mass-Centre determinations as reducible to Quadrature and to be solved by introducing the notion of ‘Momentum’ = instantaneous change, thus going beyond Barrow. Newton's ‘Methodus Fluxionum et Serierum infinitarum’ was ready for the press before 1672, but not printed till 1736. In it he proposes, (1) to find the velocity at any instant from the space traversed up to each instant, (2) to find the latter (space) from the former (velocity) — the two problems of Derivation and Integration conceived kinematically. The equicrescent magnitude x, as a space, is called *fluens* (Cavalieri *fluens,* 1639, Napier *fluxus,* 1614, Clavius *fluere,* 1574); the velocity he writes x and calls *fluxio* — our Derivative (as to the time t). *Momentum* varies as fluxion, is written xo, and corresponds to our Differential x (incrementa indefinite parva). This treatise seems to have been revised after 1673, hence does not clearly attest Newton's knowledge in 1671. *Leibnitz* wrote, 26 Oct. 1675 (following Cavalieri), *Omnia w,* etc.; but 29 Oct. 1675, *Utile erit scribi* $\int$ *pro omn. ut* $\int l$ *pro omn. l id est summa ipsorum l;* again, the same day, *nempe ut* $\int$ *augebit, ita d minuet dimensiones.* $\int$ *autem significat summam, d differentiam.* There and then was born the “Algorithm of the Differential” and Integral “Calculus.” Under date of 11 Nov. 1673, Leibnitz wrote $\int y dy = \frac{y^2}{2}$, but the 3 was originally 5. His “Characteristic Triangle,” equivalent to Differential Triangle, he took not from Barrow but from Pascal. All attempts to show any real dependence of Leibnitz on Newton have failed. The germs of the new Method were abroad in the air.

Bibliography.— Leibnitz and his school, especially the Bernouillis, poured forth memoirs abundantly. Leibnitz' first, ‘Nova Methodus pro maximis et minimis, itemque tangentibus, etc.,’ appeared in the Leipzig *Acta Eruditorum,* 1684. Newton gave his method of prime and ultimate ratios in geometric form in his ‘Philosophiæ Naturalis Principia Mathematica,’ 1687. Johann Bernouilli's ‘Lectiones Mathematicæ’ was the first textbook of the Integral Calculus, composed at Paris 1691–92, published 1742; Taylor, ‘Methodus incrementorum directa et inversa’ (1715); D'Alembert, ‘Mémoire sur le calcul intégral’ (1739); Maclaurin, ‘A Treatise on Fluxions’ (1742); Euler, ‘Introductio in Analysin Infinitorum’ (1748) — resuming and expanding all knowledge on the subject, “one of the most contentful, beautiful, and fruitful works that ever left the press,”— ‘Institutiones Calculi Integralis’ (1768–70); Cramer, ‘Introduction à l'analyse des lignes courbes algébriques’ (1750); Lacroix, ‘Traité du calcul dif. et du cal. int.’ (1797); Lagrange, ‘Théorie des fonctions analytiques’ (1797); Cauchy, ‘Cours d'analyse’ (1821), ‘Leçons sur le calcul différentiel’ (1829); Duhamel, ‘Cours d'analyse’ (1840), third edition, by Bertrand (1874–75); De Morgan, ‘Diff. and Int. Calculus’ (1842); Todhunter, ‘Diff. and Int. Calculus’ (1852); Price, ‘Infinitesimal Calculus’ (1854); Gerhardt, ‘Die Entdeckung der höheren Analysis’ (1855); Bertrand, ‘Traité du Cal. Diff. et du Cal. Int.’ (1864–70); Hermite, ‘Cours d'Analyse’ (1873); Williamson, ‘Dif. and Int. Calculus’ (1872–74); Meyer, ‘Theorie der bestimmten Integrale’— nach Lejeune-Dirichlet (1875); Lipschitz, ‘Lehrbuch der Analysis’ (1877–80); Houël, ‘Cours de Calcul Infinitésimal’ (1878–79); Dini, ‘Analisi Infinitesimale’ (1877–78), ‘Fondamenti per la teorica delle funzioni di variabili reali’ (1878); Harnack, ‘Die Elemente der Dif.-und Int. Rechung’ (1881); Stolz, ‘Allgemeine Arithmetik’ (1885–86), ‘Grundzüge der Differential- und Integralrechnung’ (1893–96–99); Tannery, ‘Introduction à la théorie des fonctions d'une variable’ (1886); Laurent, ‘Traité d'Analyse’ (1885–92); Picard, ‘Traité d'Analyse’ (1891–1903); Genocchi-Peano, ‘Calcolo differenziale e principii di calcolo integrale’ (1884, German translation 1898–99); Cantor, ‘Geschichte der Mathematik’ (1880–1900–01); Jordan, ‘Cours d'Analyse’ (1893–94–96); Serret, ‘Cours de Calcul dif. et int.’ (1868, Harnack's German translation, 2d ed., by Bohlmann and Zermelo, 1899–1904–05); de la Vallée Poussin, ‘Cours d'Analyse infinitésimale’ (1903); Goursat, ‘Cours d'Analyse mathématique’ (1902–04); Humbert, ‘Cours d'Analyse’ (1903–04); Borel, ‘Leçons sur les fonctions de variables réelles’ (1905); Kiepert-Stegemann, ‘Grundriss der Differential- u. Integral-rechnung’ (1905).

Elementary textbooks on the calculus are legion, and of very various merits, though those in favor at American universities do not vary much from type. Those of Byerly and of Osgood are perhaps as good as any. Among the older books, those of Williamson, though in many respects obsolete, give a training in the purely formal treatment of the subject that is not to be surpassed. The more advanced books generally go by the name of ‘Cours d'Analyse’ or ‘Introductions to Analysis’; they partake equally of the nature of textbooks and of independent investigations. They are only accessible to those who already have a thorough grounding in the elements of the Calculus.

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CALCULUS OF VARIATIONS, The.

The *Calculus of Variations* is a natural outgrowth of the *Infinitesimal Calculus* (q.v.) — in particular of the *Integral Calculus* (q.v.) and of

Differential Equations (q.v.). In the Integral Calculus, properly speaking, only integrals of the type $\int f(x, a_1, a_2 \ldots)dx$ are considered, where $f(x, a_1, a_2, \ldots)$ is a function of the variable of integration x and of several parameters a_1 $a_2, \ldots$ which are independent of x. In solving differential equations of the type $dy/dx=f(x,y)$ we are in one sense dealing with a new type of integral, $\int f(x,y)dx$. Such integrals, in which y is to be replaced by a certain function of x, are called *line integrals.*

The integrals considered in the Calculus of Variations are essentially of this kind, but we shall see that the more interesting problems are those in which still another element is introduced. The integral

$$(1) \qquad I=\int_{x_0}^{x_1} f(x, y, y')dx,$$

where $y'=dy/dx$, can be evaluated whenever y is known as a function of x. For if $y=\phi(x)$ be the known value of y in terms of x, and if $\phi(x)$ and $\phi'(x)=d\phi(x)/dx$ be substituted for y and y' respectively under the integral sign, the integrand becomes a function of x alone, and the integral itself has a definite numerical value, at least under certain very general restrictions which need not be stated here. Thus to every function of x which can be substituted for y there corresponds a definite number — the value of x and y. We shall denote the value of I relation $y=\phi(x)$ defines a curve C in the plane of x and y. We shall denote the value of I which corresponds to the function $\phi(x)$ by the symbol I_c.

The central problem of the Calculus of Variations is the determination of a curve $K[y=\phi(x)]$, for which the value of I, I_K, is less than [greater than] the value of I for any other curve C $[y=\varphi(x)]$, which satisfies the conditions of the particular example.

In most of the simpler examples it is specified or implied by the conditions of the problem that the curves C considered shall all pass through each of two given fixed points $P_0(x_0, y_0)$ and P_1 (x_1, y_1), whose abscissæ are respectively x_0 and x_1, the limits of integration of the integral I. Hence only those functions of x, $\phi(x)$ are to be considered for which $\phi(x_0)=y_0$ and $\phi(x_1)=y_1$.

In order to clarify the general problem, let us consider the example

$$L=\int_{x_0}^{x_1}\sqrt{1+y'^2}\,dx.$$

This is a familiar integral; it is the formula for the length of any curve $y=\phi(x)$ between any two of its points. With respect to this integral the statement of the simplest problem of the Calculus of Variations is as follows: Given two fixed points P_0 (x_0, y_0) and P_1 (x_1, y_1) in the xy plane; to determine that curve $y=\phi(x)$ joining P_0 and P_1 for which the value of the integral L (i.e., the length of the arc P_0P_1) is at a minimum. Accepting the Euclidean postulate that the shortest distance between two points is measured along the straight line joining them, it is evident a priori that the solution of this example is the straight line P_0P_1, or

$$y=y_0+(x-x_0)(y_1-y_0)/(x_1-x_0).$$

It is at least plausible that any conditions which we may discover must, in this particular example, be satisfied by this function.

It is easy to see how this simple problem may be generalized. For we might inquire what is the shortest path between a fixed point and a fixed curve, or between two fixed curves. Again, obstacles may be placed in the plane, and the shortest path then sought. This latter idea leads to an important application of the general theory: the determination of the shortest path between any two fixed points of a given surface, the surface being thought of as an obstacle placed in the plane. The most general problem of the kind mentioned above may be thought of as the determination of a certain shortest path.

An entirely distinct generalization of the preceding problem is that in which the integrand involves derivatives of higher order than the first, i.e., of the type: $\int f(x, y, y', y'', \ldots y^{(n)})dx$. Another is that in which the integral involves several dependent variables: $\int f(x, y, z, \ldots, y', z', \ldots)dx$. Finally, the integral considered may involve two (or more) independent variables and require two integrations: $\int\int f(x, y, z, p, q)\,dx\,dy$, where p and q denote $\partial z/\partial x$ and $\partial z/\partial y$, respectively, and where the function to be determined is a function of x and y which is to be substituted for z. Further generalizations are evident and would tend only to confuse if stated here. We shall return briefly to these generalized problems, but we shall state theorems principally for the simple integral I in one dependent and one independent variable. Many of these theorems can be generalized without essential difficulty to the other cases which have been mentioned.

Returning to the integral (1), let us consider the history of the problem very briefly. Although a previous problem had been considered by Newton in 1687 ('Phil. nat. prin. Math.,' II, Sec. 7, Prop. 34), the first problem which gave rise to any general theory and encouraged investigation was the so-called problem of the brachistochrone — or curve of quickest descent — which we shall discuss as a particular example. This problem was stated by Johann Bernouilli in 1698, solved by him in the following year, by his brother Jacob in 1701 in an important memoir dealing with more general problems, and by Euler in 1744 in an important treatise 'Methodus inveniendi lineas curvas…'. It has remained of interest down to the present day, probably the last paper concerning it being that by Bolza, 'Bull. Amer. Math. Soc., 1904, No. 1,' in which a final solution is given. In the paper mentioned Euler first gave the first necessary condition (known as "Euler's condition," or less properly as "Lagrange's condition") in its general form, and developed the theory in several directions, solving incidentally many problems from the formal standpoint. Following Euler, Lagrange introduced many simplifications and generalizations in a series of important papers (cf. his 'Works,' and his books 'Théorie des fonctions' and 'Calcul des fonctions'). In particular the Method of Multipliers for the treatment of problems of relative extrema, which we shall discuss briefly, is due to Lagrange. The other prominent names in the early history are Legendre, for whom the second condition is named; Gauss, who first studied double integrals with variable limits; Jacobi, who discovered the condition which bears his name; and Du Bois Reymond, who initiated the very modern critical development of the theory. We shall restrict ourselves to a reference to Todhunter, 'A History of ... the Calculus of Variations...' (Cambridge 1861); and Pascal, 'Calcolo delle variazioni' (Milan 1897, German trans. by Schepp, 1899); and Kneser, 'Variationsrechnung' and 'Ency. der Math. Wiss., II A 8, 1900'; and Bolza, 'Lectures on the Calculus of Variations' (Chicago 1905). In these books exact and complete references to the literature of the subject and notes concerning its history up to the dates of publication may be found. It should be noted that only the latter of these books contains references to the important developments published since 1900.

Precise Statement of the Problem.— It is evident upon examination that the naïve conception of the problem does not permit of exact mathematical treatment. For definiteness, let us suppose that the function $f(x,y,y')$ in (1) is an analytical function of its three arguments inside of a certain three-dimensional region R, which may be finite or infinite, but which expressly does not include any points at infinity. Let us also restrict ourselves to curves of the type $y=\phi(x)$, where $\phi(x)$, together with its first derivative $\phi'(x)$, is a continuous, single-valued function of x in the interval $x_0 \leq x \leq x_1$, and where $\phi(x_0)$ and $\phi(x_1)$ are equal, respectively, to the ordinates y_0 and y_1 of the fixed points P_0 and P_1. We shall call these "curves of the class B." If there is a single one of these curves $y=\psi(x)$, or K, for which I_K is less than [greater than] I_c for any other curve C [$y=\phi(x)$] of the class B, that curve K is said to render the given integral I an *absolute minimum* [maximum]. It is evident that this will rarely occur, as is also the case in extrema of functions of a single variable. If we now set

(2) $\phi(x) = \psi(x) + \eta(x)$, i.e., $\eta(x) = \phi(x) - \psi(x)$,

and if there exists a positive number δ such that I_K is less than [greater than] I_c whenever the condition

$$(3) \qquad |\eta(x)| < \delta, \quad |\eta'(x)| < \delta, \quad x_0 \leq x \leq x_1 ,$$

then K is said to render the integral I a ***weak minimum*** [maximum] among the curves of the class B. If instead of (3) we merely require the condition

$$(4) \qquad |\eta(x)| < \delta, \quad x_0 < x \leq x_1,$$

the curve K is said to render a *strong minimum* [maximum]. If in addition to (3) [or (4)] we also require that

$$\eta(x_i) = 0,$$

$$(5) \qquad x_0 + (i-2) \cdot \delta \leq x_i \leq x_0 + (i-1) \cdot \delta \leq x_1,$$

$$i = 2, 3, \ldots (n+1),$$

where $n \cdot \delta = x_1 = x_0$, the curve K is said to render I a ***limited weak* [*strong*] *minimum* [*maximum*]**.

Geometrically these conditions mean that the curves compared to K must lie, in the case of a strong extremum (i.e., maximum or minimum), close to the curve K; in the case of the weak extremum, they must lie close to K and vary only a little from K in direction; in the case of a limited extremum, they must cut K at least once in every vertical strip of width δ.

It is easy to show that if K is to render I an extremum (of any sort), $\psi(x)$ must in general satisfy the equation

$$(6) \qquad \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) - \frac{\partial f}{\partial y} = 0,$$

or

$$\frac{\partial^2 f}{\partial y'^2} y'' + \frac{\partial^2 f}{\partial y \partial y'} y' + \frac{\partial^2 f}{\partial x \partial y'} - \frac{\partial f}{\partial y} = 0,$$

which is known as *Euler's* (or less properly as *Lagrange's*) *equation.* For we have

$$(7) \quad I_c = \int_{x_0}^{x_1} f\left\{x, \quad \psi(x) + \eta(x), \quad \psi'(x) + \eta'(x)\right\} dx,$$

which must be a minimum [maximum] for $\eta(x) = 0$. Replacing $\eta(x)$ by $\varepsilon . \lambda(x)$, where $\lambda(x)$ is an arbitrary function and ε is a variable parameter, I_c will evidently be a function of the parameter ε alone:

$$(8) \quad I_c = F(\varepsilon) = \int_{x_0}^{x_1} f(x), \psi + \varepsilon . \lambda, \ \psi' + \varepsilon \cdot \lambda')dx.$$

It is readily demonstrated that the ordinary rule applies and that we can have an extremium only if

$$(9) \quad dI_c/d\varepsilon = F'(\varepsilon) = \int_{x_0}^{x_1} \{f_y(x, \ \psi + \varepsilon \cdot \lambda, \ \psi' + \varepsilon \cdot \lambda')\lambda$$
$$+ f_{y'}(x, \psi + \varepsilon\lambda, \ \psi' + \varepsilon\lambda') \cdot \lambda'\} dx = 0,$$

when $\varepsilon = 0$, or $F'(0) = \int_{x_0}^{x_1} (f_y \cdot \lambda + f_{y'}\lambda')dx = 0$,

where $f_y = \partial f/\partial y$, etc. Integrating the second term by parts, we get

$$(10) \qquad F'(0) = 0 = \Big[\lambda(x) f_{y'}(x, \ \psi, \psi')\Big]_{x_0}^{x_1}$$
$$+ \int_{x_0}^{x_1} \lambda(x) \left\{ f_y(x, \psi, \psi') - \frac{d}{dx} f_{y'}(x, \psi, \psi') \right\} dx,$$

or since $\lambda(x)$ evidently vanishes for $x = x_0$ and for $x = x_1$,

$$(11) \int_{x_0}^{x_1} \lambda(x) \left\{ f_y(x, \psi, \psi') - \frac{d}{dx} f_{y'}(x, \psi, \ \psi' \right\} dx = 0.$$

But $\lambda(x)$ was itself any permissible function of x, and it is not hard to prove that the integral of such a product, of which one factor is arbitrary, can vanish only if the other factor vanishes. This gives precisely the equation (6). Certain further considerations are necessary to show that this proof, which implicitly assumes the existence of the second derivative of $\psi(x)$, does not involve any restrictions. (Cf. Bolza, 'Lectures,' Chap. I).

Assuming the further details without proof, it becomes evident that any curve K, $y = \psi(x)$, which is to render I a minimum (of any sort) must satisfy the differential equation (6). Since f and its derivatives are known functions, (6) is an ordinary differential equation of the second order, linear in $d^2y/dx^2 (= y'')$. The coefficient of y'' is $d^2f/dy'^2 (= f_{y'y'})$. If this coefficient $f_{y'y'}$ does not vanish, one and only one solution of (6) passes through a given point in a given direction. The general solution of (6) contains two arbitrary constants:

(12) $y=f(x, \alpha, \beta)$.

Any one of these solutions, i.e., any solution whatever of (6) is called an *extremal*. Hence the required curve K, if it exists, must be an extremal, and it is necessary to search for it only among the extremals. But K was to connect P_0 and P_1. Usually, however, there is only one of the extremals (12) which passes through two given points, for the equations,

(13) $y_0=f(x_0, \alpha, \beta)$, $y_1=f(x_1, \alpha, \beta)$,

usually determine α and β, and hence also determine a single extremal joining P_0 and P_1. If this is actually the case, either that extremal is the required solution K, or else there is no solution of the problem.

A large number of special cases lead to differential equations which can be solved directly. For example, if $I=\int_{x_0}^{x_1} \sqrt{1+y'^2}dx$, we shall have $f(x, y, y')=\sqrt{1+y'^2}$, whence $f_x=f_y=f_{xy'}=f_{yy'}=f_{xy}=0, f_{y'}=y'/(1+y')^{\frac{1}{2}}$, $f_{y'y'}=1/(1+y')^{\frac{3}{2}}$, and the equation (6) takes the form $y''=0$. The only solutions of this differential equation are the straight lines $y=ax+b$. It follows that if there is any curve of the class B in the plane along which the distance between two given fixed points is at a minimum, that curve is the straight line joining the two points. This result is independent of the Euclidean postulate, and depends only upon the definition of length by means of the preceding integral.

The problem of the brachistocrone, mentioned above, is to find the curve along which a particle with initial velocity v_0 will descend most quickly from a given initial point P_0 to another given point P_1. It is easy to show that the time of descent is given by the formula

$$t=\int_{x_0}^{x_1}\frac{\sqrt{1+y'^2}}{\sqrt{v_0^2-2g(x-x_0)}}dx ,$$

hence Euler's equation (6) is

$$\frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right)=\frac{d}{dx}\left(\frac{y'}{\sqrt{1+y'^2}\sqrt{v_0-2g(x-x_0)}}\right)=0 ,$$

which gives at once $y'^2=c^2(1+y'^2)(v_0+2g(x_0-x))$. This equation may be readily solved in parameter form, and we find:

$$x-A=-\frac{A+B}{2}(1-\cos\omega),$$

$$y-C=-\frac{A+B}{2}(\omega-\sin\omega),$$

where

$$A=\frac{v_0}{2g}+x_0,$$

$$B=\frac{c^2-v_0^2}{2g}\ x_0 .$$

These extremals are cycloids on horizontal bases, the radius of the generating circle being $(A+B)/2$, and one cusp being at the point (A, C). Further investigation is necessary to decide just when a given pair of points can be connected by such a cycloid (cf. Bolza, 'Lectures,' p. 236). If such a cycloid can be drawn, we can infer that it is the solution if there is any solution. If no such cycloid can be drawn, we can infer that there is no solution in the region R.

The problem of finding the geodetic lines on a given surface is that of minimizing the integral,

$$I=\int_{x_0}^{x}(E+2Fy'+Gy'^2)^{\frac{1}{2}}dx,$$

where $z=\phi(x,y)$ is the surface and where $E=1+z^2_x$, $F=z_xz_y$, $G=1+z^2_y$. Euler's equation therefore coincides with the usual equation for the geodetic lines:

$$\frac{d}{dx}\left(\frac{Gy'+F}{\sqrt{E+2Fy'+Gy'^2}}\right)=\frac{E_y+2F_yy'+G_yy'^2}{2\sqrt{E+2Fy'+Gy^2}},$$

and the geodetic lines are the extremals of this problem, i.e., no line not a geodetic can be a shortest line on a surface.

Though the proof of the necessity of Euler's condition was satisfactory, even in a cruder form, to the originators of the subject, a desire to formulate sufficient conditions arose. Thus Legendre showed that a *second necessary condition* for a minimum [maximum] is that the condition

$$f_{y'y'}(x, \psi(x), \psi'(x))>0[<0] \text{ for } x_0\leqq x\leqq x_1$$

be satisfied along the supposed solution $y=\psi(x)$ between the end points. We shall prove this, and we shall see that the same condition is actually a sufficient condition for a weak limited minimum if the sign $=$ be removed.

Jacobi then showed, by means of the second variation of the given integral, that a *third necessary condition* for a minimum [maximum] is that the quantity

$$\Delta(x, x_0)=\eta_1(x)\eta_2(x_0)-\eta_2(x)\eta_1(x_0)$$

should not vanish for any value of x in the interval $x_0<x<x_1$, where $\Delta(x, x_0)$ is a solution of the equation

$$f_{y'y'}\eta''+\frac{df_{y'y'}}{dx}\eta+\left(\frac{df_{yy'}}{dx}-f_{yy}\right)\eta=0,$$

which vanishes for $x=x_0$. The proof, which is omitted, can be found in Bolza, 'Lectures,' Chap. 2. A beautiful geometrical interpretation of this condition exists: if we consider the one parameter family of exterminals through (x_0, y_0), and call their envelope E, the extremal which joins x_0 to any point beyond its point of tangency with E cannot possibly render the integral a minimum [maximum] between those two points, i.e., the envelope of the extremals through (x_0, y_0) *bounds* all the points which can possibly be reached by a minimizing extremal from x.

It was long believed that Jacobi's condition, together with the previous two, was a sufficient condition. That such is not the case was first pointed out by Weierstrass, who also showed that *Jacobi's condition*, while not sufficient for a minimum in general, *is sufficient for a weak minimum* (if the point (x_1, y_1) lies *inside* the envelope of the extremals through (x_0, y_0). Cf. Bolza, 'Lectures,' Chap. 3.

That the preceding conditions are not sufficient is most readily seen by giving an actual example in which the extremals, though all the above conditions are satisfied, do not minimize the integral. Such is the example (see Bolza, 'Lectures,' p. 73),

$$f(x, y, y')=y'^2(y'+1)^2.$$

Here the extremals are straight lines, but it is easy to join two points for which all the preceding conditions are satisfied by a simple broken line for which the value of the integral is less than that along the straight line extremal. Of course, the comparison line used varies considerably from the straight line extremal in direction, though not in position.

Weierstrass, in 1879, gave a fourth necessary condition. He defines a new function,

$$E(x,y,y',p)=f(x,y,y')-f(x,y,p) \\ -(y'-p)\,f_p(x,y,p).$$

Then *Weierstrass's (fourth) necessary condition* for a minimum [maximum] is

$$E(x,y,y',p) \geqq 0 \ [\leqq 0] \quad x_0 \leqq x \leqq x_1,$$

where x, y, p are the values of $x, y, dy/dx$ along the extremal between the end points, and where y' is any finite number whatever. (Cf. Bolza, 'Lectures,' Chap. 3). Since we have

$$\underset{y'=p}{\text{Limit}}\left[\frac{E(x,y,y',p)}{(y'-p)^2}\right]=\frac{1}{2}\,f_{y'y'}\Big]_{y'=p},$$

it follows that it is also necessary that $f_{y'y'} \geqq 0$, which is precisely *the second (Legendre's) necessary condition* mentioned above. It is easy to show that if (*a*) the end points can be joined by an extremal K, (*b*) a one parameter family of extremals $[y=\psi(x, a)]$ can be found, one of which is K itself, and one and only one of which passes through each point of the plane near K, so that $y'=p(x, y)$ can be found, i.e., a function which gives the slope of the extremal of the family at any point (x, y) near K, then the integral

$$J=\int_{x_0}^{x_1}[f(x,y,p)+(y'-p)\,f_p(x,y,p)]dx$$

is independent of the path of integration inside the field just constructed near K, and we have

$$I_c-I_k=\int_{x_0}^{x_1}E(x,y,y'\,p)dx\,\Big]_{\text{along } c''},$$

where C is any curve of the class B in the field about K, since $I_k=J_k=J_c$. It follows that the condition

$$E(x,y,y',p)\geqq 0, \quad x_0\leqq x\leqq x_1,$$

for all x and y near K and for the function $p(x, y)$ just mentioned and for any finite value of y' whatever, is a *sufficient condition for a strong minimum*, if the sign of equality holds only for $p=y'$. Cf. Osgood, 'Annals of Mathematics,' II, 3; Bolza, 'Lectures,' Chap. 3.

It is possible to show (cf. Hedrick, 'Bull. A. M. S.,' IX, 1) that *for a limited minimum the conditions remain the same except that Jacobi's condition may be omitted.* The conditions in the various cases may be summarized in the following scheme:

	Limited variations		Unlimited variations	
	Weak	Strong	Weak	Strong
Necessary	**Euler's, Legendre's necessary.**	Euler's, Legendre's necessary, Weierstrass's necessary.	Euler's, Legendre's necessary, Jacobi's necessary.	Euler's, Legendre's necessary, Jacobi's necessary, Weierstrass's necessary.
Sufficient	**Euler's, Legendre's sufficient.**	Euler's, Legendre's sufficient, Weierstrass's sufficient.	Euler's Legendre's sufficient, Jacobi's necessary.	Euler's, Legendre's sufficient, Jacobi's necessary, Weierstrass's sufficient.

It is seen on glancing at the table that from the simple conditions (Euler's and Legendre's) for limited weak variation we proceed to any other case by adding Weierstrass's conditions in the case of a strong minimum, and Jacobi's in case of an unlimited mimimum, only. A fifth necessary condition for a strong extremum, independent of all the others, has been discovered by Bolza.

In special problems the irksomeness of these conditions can sometimes be circumvented. For instance, *given a problem in which* $\frac{\partial^2 f}{\partial y'^2}>0$ *for all values of x, y, y', then the necessary and sufficient condition for a limited strong minimum is the possibility of finding a solution of Euler's equation joining the two given end points.* Such is the case in the geodetic problem and also in the integral which leads to Hamilton's principle; and in each of these cases, fortunately, a limited strong minimum is all that is desired. Similar simplification occurs in every case when $\frac{\partial^2 f}{\partial y'^2}>0$ for *all* values of x, y, y'. For then Legendre's and Weierstrass's conditions are always satisfied, and may be abstracted from the above table. For this reason Hilbert has called a problem in which $\frac{\partial^2 f}{\partial y'^2}>0$ for all x, y, y' contained in a singly connected region R, in which the given end points lie, a «*regular*» problem of the Calculus of Variations.

Considering the example $\int_{x_0}^{x_1}\sqrt{1+y'^2}\,dx$, we see that $f_{y'y'}>0$ for all finite values of x, y, and y' whatever. Since

$$E(x,y,y',p)=\frac{(y'-p)^2}{2}\,f_{y'y'}(x,y,\xi),\ y'\gtrless\xi\gtrless p$$

it follows that such an example surely satisfies Weierstrass's sufficient condition, provided that a field exist in the manner specified above. But in this case, since the extremals are all straight lines in the plane, it is obvious that all other conditions are satisfied. Hence the straight line joining any two points actually minimizes the given integral, i.e., the straight line is the «shortest» line between any two of its points if the preceding integral be the definition of length.

In the problem of the brachistochrone, mentioned above, it is shown that the extremals found (cycloids) actually render the integral of the problem a minimum provided no cusp lies between the end points. (Cf. Bolza, 'Lectures,' Chap. 4, pp. 126, 136, 146).

Returning to the integral which defines length, it is evident that some other integral might as well have been selected as the definition of length, if we are not to assume an intuitive knowledge of it. The variety of choice is limited only by the selection of those properties which we desire to have hold. This leads very naturally to The Inverse Problem of the Calculus of Variations: Given a set of curves which form a two-parameter family. What is the condition that they be the extremals of a problem of the Calculus of Variations? What are the conditions that they actually render the integral thus discovered a minimum? Let

$y = F(x, a, b)$ be the given family. Then (cf. Bolza, 'Lectures,' p. 31) the integrand of any integral for which these are extremals must satisfy the equation

$$\frac{\partial f}{\partial y} - \frac{\partial^2 f}{\partial y' \partial x} - \frac{\partial^2 f}{\partial y' \partial y} y' = G(x, y, y') \cdot \frac{\partial^2 f}{\partial y' \partial y'},$$

where $y'' = G(x, y, y')$ is the differential equation of the given family. This equation for $f(x, y, y')$ always has an infinite number of solutions, of which only those are actually solutions of the given inverse problem which satisfy the relation $f_{y'y'} > 0$, and these are solutions in any region free from envelopes of one-parameter families of the given extremals. Some interesting conclusions for particular forms are to be found in a paper by Stromquist, 'Transactions of American Mathematical Society' (1905).

Another interesting class of problems are the so-called isoperimetric problems. These are problems in which a further restriction is placed upon the solution by requiring that it shall give a second (given) integral a given value. Such is, for example, the problem of finding the curve of maximum area with a given perimeter. The problem is treated by means of the so-called method of multipliers, which is too long for presentation here. Consult Bolza, 'Lectures,' Chap. 6.

This article is too short to give any account of the details of the work for double integrals. Suffice it to say that the known methods follow closely those given above for simple integrals. In the other possible problems mentioned above the same holds true. An interesting application of these other problems occurs in the well-known *Problem of Dirichlet,* which is fundamental in mathematical work. Another is the important problem of *Minimum Surfaces.* Another is the well-known theory of mechanics based upon *Hamilton's Principle* or one of the analogous mechanical principles. The modern methods have made these theories more rigorous.

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The foreign literature is well collected for reference in the footnotes to Bolza's lectures and in the following books and articles: Kneser, 'Variationsrechnung' (Braunschweig 1900); 'Ency. d. Math. Wiss.,' (II, A 8) (Leipzig 1904); Moigno-Lindeloff, 'Calcul des Variations' (Paris 1861); Pascal, 'Calcolo delle Variazioni' (Milano 1897, German trans., Leipzig 1899); Todhunter, 'History of the Calculus of Variations' (Cambridge 1861); Zermelo u. Hahn, 'Ency. d. Math. Wiss.,' (II A 8a) (Leipzig 1904).

The literature is altogether extremely extensive, covering, as it does, a period of over 200 years. It is evident that the more important papers for present use are those of recent date.

An important phase of the subject which has necessarily been overlooked is the general proof by Hilbert (1900) that at least an *improper* minimum always exists. Consult Bolza, 'Lectures,' (chap. 7).

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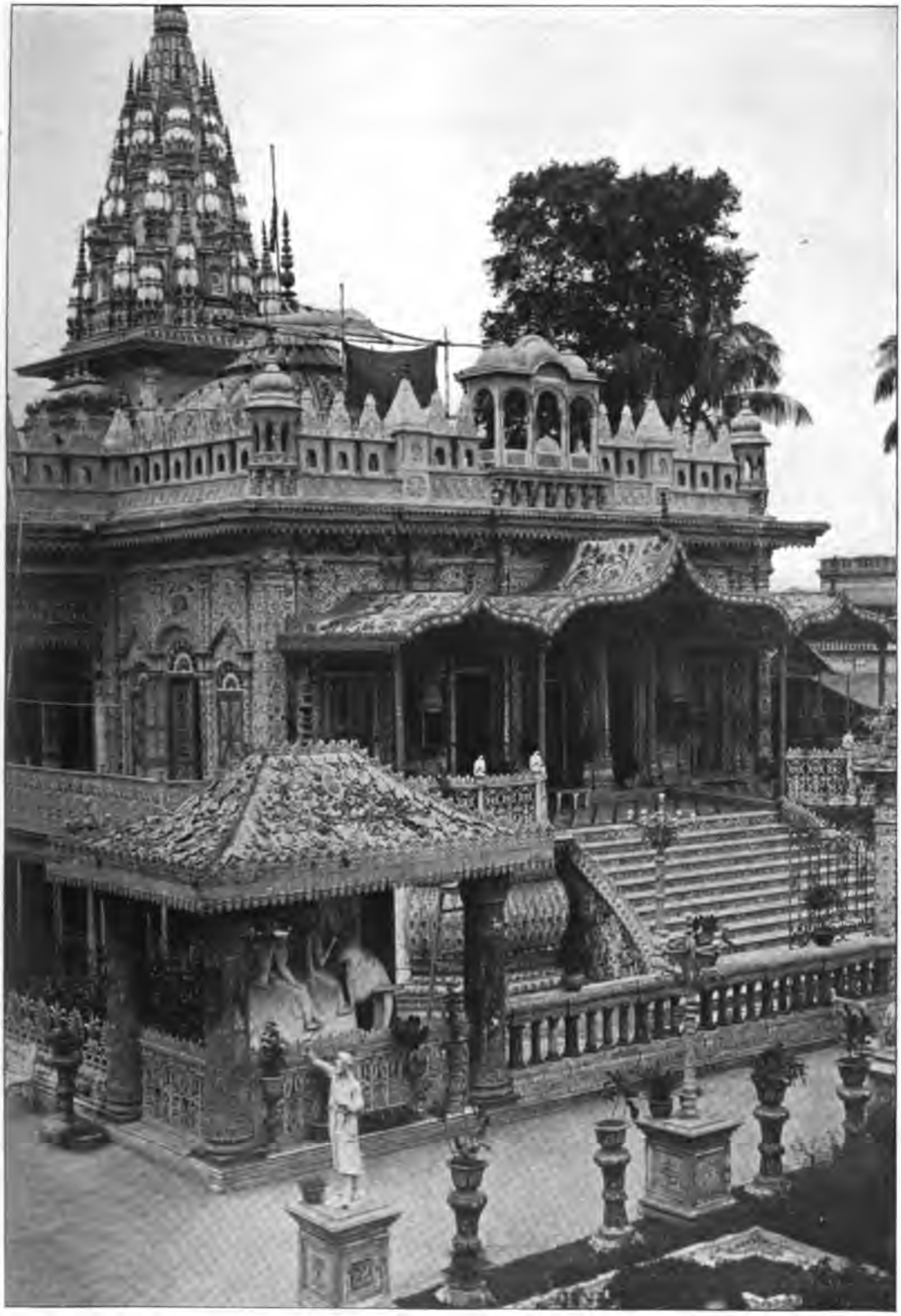
CALCUTTA ("the ghaut or landing-place of Kâli" from a famous shrine of this goddess), India, the capital of the presidency and province of Bengal, and until 1911 the capital of British India, is situated on the left bank of the Hooghly (Húghli), a branch of the Ganges, about 80 miles from the Bay of Bengal. The Hooghly is navigable up to the city for vessels of 4,000 tons or drawing 26 feet; the navigation, however, on account of sand-banks which are continually changing their size and position, is dangerous. The river opposite the city varies in breadth from rather more than a quarter to three-quarters of a mile. The city may be said to occupy an area extending along the river for about five miles from north to south, and stretching eastward to a distance of nearly two miles in the south, narrowing in the north to about half a mile. The eastern boundary is nominally formed by what is known as the Circular road, the Lower Circular road forming part of the southern boundary. Another eastern boundary on the north is the Circular Canal, which runs for some distance parallel to the Circular road. The southwestern portion of the area thus spoken of is formed by the Maidan, a great park stretching along the river bank for about one and three-quarter miles, with a breadth in the south of one and a half miles. This grassy and tree-studded area is one of the ornaments of Calcutta; it is intersected by fine drives, and is partly occupied by public gardens, a cricket ground, race-course, etc., and partly by Fort William, which rises from the river bank. The fort was built in 1757–73, having been begun by Clive after the battle of Plassey, and is said to have cost about $10,000,000. Along the river bank there is a promenade and drive known as the Strand road, which has for the most part been reclaimed from the river by successive embankments. Along the east side of the Maidan runs Chauringhi road, which is lined with magnificent residences, and forms the front of the European fashionable residential quarter. Along the north side of the Maidan runs a road or street known as the Esplanade, on the north side of which are the old Government House and other public buildings. The European commercial quarter lies north of the Esplanade, between it and another street called Canning street, having the river on the west. The centre of this area is occupied by Dalhousie square (enclosing a large tank or reservoir), and here there are a number of public buildings including the post-office, telegraph



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THE JAIN TEMPLE, CALCUTTA

office, custom house, Bengal secretariat, etc. The European retail trading quarter occupies a small area to the east of the above area. Everywhere outside of the European quarters Calcutta is interspersed with *bastis,* or native hamlets of mud huts, which form great outlying suburbs. "The growth of the European quarters, and the municipal clearings demanded by improved sanitation, are pushing these mud hamlets outward in all directions, but especially toward the east. . . . They have given rise to the reproach that Calcutta, while a city of palaces in front, is one of pigstyes in the rear." First among the public buildings is old Government House, the viceregal residence, situated, as already mentioned, on the Esplanade. It was built in 1799–1804, and with its grounds occupies six acres. Four wings extend toward the four points of the compass from a central mass which is crowned with a dome and approach from the north by a splendid flight of steps. The High Court, the town-hall, the Bank of Bengal, the currency office, post-office, etc., are among the other public buildings in this locality, while further to the north stands the mint, near the banks of the Hooghly. The chief of the Anglican churches in Calcutta is the cathedral of Saint Paul's, at the southeastern corner of the Maidan, a building in the "Indo-Gothic" style, with a tower and spire 201 feet high, consecrated in 1847. Saint John's Church, or the old cathedral, is another important church, in the graveyard surrounding which is the tomb of Job Charnock, founder of Calcutta. The chief Presbyterian church is Saint Andrew's, or the Scotch Kirk, a handsome Grecian building with a spire. The Roman Catholics have a cathedral and several other churches; and there are also places of worship for Greeks, Parsees and Hebrews. Hindu temples are numerous but uninteresting; among the Mohammedan mosques the only one of note is that which was built and endowed by Prince Ghulam Mohammed, son of Tippoo Sultan. The religious, educational and benevolent institutions are numerous. Various missionary and other religious bodies, British, European and American, are well represented. There are four government colleges — the Presidency College, the Sanskrit College, the Mohammedan College and the Bethune Girls' School. There are five colleges mainly supported by missionary efforts; besides several others, some of them under native management. Other educational institutions include Calcutta Medical College, a government school of art, Campbell Vernacular Medical School and a school of engineering at Howrah, on the western side of the river. Besides these there is the Calcutta University, an examining and degree-conferring institution. Among the hospitals are the Medical College Hospital, the General Hospital, the Mayo Hospital (for natives), and the Eden Hospital for women and children. The Martinière (so named from its founder, General Martin, a Frenchman in the East India Company's service) is an important institution for the board and education of indigent Christian children. Elementary and other schools are increasing in numbers. The Asiatic Society was founded by Sir W. Jones in 1784 for the study of the languages, literature and antiquities of Asia. The Botanic Garden occupies a large area on the right bank of the river. Calcutta possesses a number of public monuments, most of them in or about the Maidan. Several governors-general are thus commemorated, as also Sir David Ochterlony and Sir James Outram, "the Bayard of the East," of whom there is an admirable equestrian statue by Foley. The city is lighted partly by gas, partly by electricity. There is an extensive system of tramways. The sanitation of Calcutta, though vastly improved in recent years, is still defective, more especially in the suburban districts, where the *bastis* or native huts are so numerous. The Calcutta Improvement Commission was formed in 1912 to aid in town planning and in the improvement of public health. One difficulty in the way is the site of the city itself, which is practically a dead level. An act which came into force in 1889 brought a large additional area under the municipal authorities, and since then much has been done in the way of drainage, opening up of arterial streets, alignment of roads, etc. The water supply has also been greatly increased, and filtered water from the Hooghly (there is a pumping station at Palta, 16 miles above Calcutta) is now available at the daily rate of 36 gallons per head in the city, and over 15 in the suburbs, besides a supply of unfiltered water for washing and other purposes. The mortality throughout the entire municipality in 1912 was 28.1 per 1,000, a great improvement on former times, and the birth-rate 21.06 per 1,000. The death-rate is far higher among the natives than among the Europeans, and in the native quarters cholera is said to be seldom absent. The healthiest months are July and August, which form part of the season of rains; the unhealthiest are November, December and January. The mean temperature is about 79°, the average rainfall a little over 66 inches. The port of Calcutta extends for about 10 miles along the river, and is under the management of a body of commissioners. Opposite the city it is crossed by a great pontoon bridge, which gives communication with Howrah for vehicles and foot passengers, and can be opened at one point to let vessels pass up or down. It cost $1,100,000. Besides the accommodation for shipping furnished by the river, there are also several docks. The trade is very large, Calcutta being the commercial centre of India. There is a very extensive inland trade by the Ganges and its connections, as also by railways (the chief of which start from Howrah), while almost the whole foreign trade of this part of India is monopolized by Calcutta. In 1913–14 the gross tonnage of the shipping inward and outward was over 6,926,817 tons; the total of exports and imports at the wet docks was about 4,800,000 tons. The total over-seas trade in merchandise during the fiscal year ended 31 March 1916, amounted to $452,786,505. The year's imports were valued at $167,666,650 and the exports at $285,119,855. The chief exports are opium, jute and jute goods, tea, grain and pulse, oilseeds, raw cotton, indigo, hides and skins, silk and silk goods, seeds, coal and coke, raw hemp, mica, etc. The most important imports are cotton goods, sugar, metals, machinery, oils, railway plant and rolling stock, cutlery, salt and spices. The jute manufacture is extensively carried on, also that of cottons.

The first factory in Bengal of the East India

Company, which was incorporated by royal charter in the year 1600, was established at Hooghly, 28 miles farther up the river, in 1644. Job Charnock, the company's agent, was driven out of this settlement in 1686, and the English then occupied part of the present site of Calcutta, which in 1689–90 became the headquarters of the commercial establishments of the company in Bengal. In 1700 the company acquired from Prince Azim, son of the Emperor Aurungzebe, the three villages of Sutánati, Kalikata (Calcutta) and Govindpore, for an annual rent of 1,195 rupees, and these formed the nucleus of the present city. The original Fort William, named after William III, was built in 1696, on a site considerably to the north of the present fort. Calcutta was taken and plundered by Suraj-ud-Dowlah in 1756, and retaken by Lord Clive in 1757. To the capture by Suraj-ud-Dowlah belongs the episode of the «Black Hole» (q.v.) of Calcutta. When the British recovered possession, much of the town was in ruins and had to be rebuilt, so that it may be said to date only from 1757. Clive built the new Fort William on the site of Govindpore, between 1757 and 1773. In 1773 Calcutta became the seat of British government for the whole of India, and so continued until 1911, when announcement was made, for political and climatic reasons, of a change of capital to the city of Delhi, the ancient seat of the Mogul empire. Pop. (1911) 896,067.

CALDARA, Polidoro. See CARAVAGGIO.

CALDER, Alexander Stirling, American sculptor: b. Philadelphia, 11 Jan. 1870. The son of Alexander Milne Calder, himself a sculptor, whose work is represented by the General Meade statue in Fairmount Park, and by the sculptural decorations in the city hall, Philadelphia, after early instruction at the Pennsylvania Academy, went to Paris and studied under Chapu and Falguière. On his return he was appointed instructor in the School of Industrial Art, Philadelphia. Among his notable productions are ‹The Dozing Hercules,› ‹Primeval Discontent,› ‹The Man Cub,› ‹The Miner,› ‹Narcissus› and the six heroic figures of leading Presbyterian theologians above the entrance to the Witherspoon Building, Philadelphia.

CALDER, James Alexander, Canadian statesman: b. Ingersoll, Ontario, 17 Sept. 1868. He was educated at Ingersoll Public School, High School, Winnipeg, and was graduated from the University of Manitoba in 1888. He entered the teaching profession, was principal of Moose Jaw High School 1891–94, inspector of schools for the Northwest territories 1894–1900 and deputy commissioner of education for the territories 1901–05. He was called to the bar of the territories in 1906. He was elected to the local legislature of Saskatchewan for South Regina in 1905, but was defeated in 1908, and afterward represented Saltcoats. As Provincial Treasurer and Minister of Education in the Scott ministry he showed a thorough mastery of the details of legislation and was aided by his singularly lucid expository style. In 1910 he became Minister of Railways. During the illness of Premier Scott he was acting head of the government, and on his retirement he declined the succession in favor of William Martin. In October 1917 he joined as one of the Western Liberal representatives the Dominion Union ministry formed by Sir Robert Borden, in which he assumed the new portfolio of Immigration and Colonization.

CALDERA, Chile, a seaport in the province of Atacama, 25 miles by rail from the city of Copiapó, and connected also by rail with other points of the central valley and west coast. Among Chilean ports, Caldera ranks as 15th in the value of imports and as 19th in the value of exports. For the mineral productions of this region, the climate and agricultural products (with the aid of irrigation) see CHILE. Pop. about 3,000.

CALDERON, Francisco Garcia, Peruvian statesman: b. Arequipa 1834; d. Lima, Peru, 21 Sept. 1905. At the age of 21 he was a professor of jurisprudence, a member of the Peruvian Congress 1867 and Minister of the Treasury 1868. After the occupation of Lima by the Chilean army, during the war between Chile, Peru and Bolivia, 1879–81, he was made president of a provisional government formed under the protection of the Chilean authorities, February 1881. His government was recognized by the United States, the Central American republics and Switzerland. He pledged himself to conduct his government upon principles not opposed to the fundamental conditions demanded by Chile for the final arrangement of peace, but failing to do this, he was arrested, 6 Nov. 1881, by order of Gen. Patrick Lynch, rear-admiral and general-in-chief of the Chileans, and sent as a prisoner to Valparaiso. Upon his return to Lima in 1886 he was elected president of the Senate and was made rector of the University of San Marcos. He worked earnestly for its rehabilitation after the war and by 1886 its restoration was in great part effected, new buildings constructed and normal university life resumed. He aided in securing the Grace contract through which Peruvian finances were placed on a sound basis and the commercial stability of the country assured a great degree of permanency. His principal work is a ‹Dictionary of Peruvian Jurisprudence,› a standard work. Consult Markham, C. R., ‹History of Peru› (Chicago 1892); Garcia's ‹Le Pérou contemporain› (Paris 1907); Martin, P., ‹Peru of the Twentieth Century› (London 1911).

CALDERON, Philip Hermogenes, English painter, of Spanish parentage: b. Poitiers, 3 May 1833; d. London, 30 April 1898. He was the son of Juan Calderon, at one time professor of Spanish literature in King's College, London. Coming to England about 1845, he became shortly afterward the pupil of a civil engineer; but his artistic ability was so pronounced that his father allowed him to devote himself to the study of art at the British Museum and the National Gallery. In 1853 he went to study under Picot at the Ecole des Beaux Arts in Paris. He first exhibited at the Academy in 1853, his picture being named ‹By the Waters of Babylon.› Among the many pictures he subsequently produced are ‹Broken Vows› (1857); ‹Far Away› (1858); ‹The Gaoler's Daughter› (1858); ‹Never More› (1860); ‹Liberating Prisoners on the Young Heir's Birthday› (1861); ‹After the Battle› (1862), one of his most successful works; ‹The English

Embassy in Paris on the Day of the Massacre of Saint Bartholomew' (1863); 'Her Most High, Noble and Puissant Grace' (1865), the last two being among his finest works; 'Whither?' (1867 — his diploma picture); 'Sighing His Soul Out in His Lady's Face' (1869); 'Spring Driving Away Winter' (1870); 'On Her Way to the Throne' (1871), a sequel to his masterpiece of 1865; 'Victory' (1873); 'Half-hours with the Best Authors'; 'La Gloire de Dijon' (1878); 'Renunciation of Saint Elizabeth of Hungary' (1891, National Gallery, London), probably his greatest work; 'Home They Brought Her Warrior Dead'; 'Aphrodite'; 'The Answer' (1897); and 'Ruth' (1897). Elected A.R.A. in 1864, he became, three years later, a full academician. He gained in 1867 the first French gold medal awarded to an English artist, and in the same year was made keeper of the Royal Academy, in which position he remained until his death. In 'Broken Vows' he betrayed a tendency to the pre-Raphaelite style, but he did not retain this style very long. His work betrays his French technical training, while his subjects reflect English popular sentiment.

CALDERON, Serafin Estebanez, Spanish writer: b. Malaga, Spain, 1799; d. Madrid, 7 Feb. 1867. He was professor of poetry and rhetoric at Granada, 1822–30, but resigned and went to Madrid. There he collected a library of old Spanish literature, especially of ballads, whether manuscript or in print; the collection is in the National Library at Madrid. He wrote a volume of poems, 'Poesias del Solitario' (1833); a novel, 'Christians and Moriscos' (1838), and a very valuable study of 'The Literature of the Moriscos.' He also wrote 'The Conquest and Loss of Portugal' and a charming volume of 'Andalusian Scenes' (1847).

CALDERÓN DE LA BARCA, Pedro, Spanish poet and playwright: b. Madrid, 17 Jan. 1600; d. there, 25 May 1681. His long life, which embraced the reigns of three kings, one of whom, Philip IV, was a generous patron, and exerted a profound influence upon the dramatist's art by demanding of him spectacular plays for his theatre in the royal palace, coincided with the golden age of the Spanish drama, and his death marked its close.

Of Calderón's life little is known except that it was uneventful and blameless, in which respect he contrasts favorably with his famous contemporary and rival, Lope de Vega. His father, who was of noble origin, served as secretary to the Treasury Board under Philip II and Philip III. When nine years of age, Calderón was sent to the Jesuit College at Madrid, from which, at the age of 14, he entered the University of Salamanca, not without first giving evidence of precocity and an interest in the drama by writing a play, known now only by title, 'The Chariot of Heaven' (i.e., Elijah's). The influence of Jesuit teaching is seen in his plays, where the dramatist reveals an unusual fondness for dialectics. Some of his most successful dramas defend the attitude of Jesuits toward the doctrine of freewill. These influences were continued at the University of Salamanca, whose professors stoutly championed the Jesuit cause against the professors of the University of Coimbra. At Salamanca Calderón studied mathematics, philosophy, geography, history, civil and canon law, and graduated in 1619. While at the university he continued to write plays, and, according to his panegyrist and earliest biographer, Vera Tassis, with such marked success that his name became known throughout Spain. Nevertheless, he planned to enter the legal profession in his native city, but, as he himself records, the desire to win a prize in a poetical tournament organized in 1620 to honor the patron saint of Madrid, Saint Isidor, made a poet of him. He failed, however, to win a prize, but in a second contest two years later he was awarded a third prize for a euphuistic poem of little promise. More significant, as indicating the esteem in which he was already held by contemporary writers, is the fact that he contributed one of three commendatory poems to the official account of the second contest prepared by Lope de Vega. In 1625 Calderón entered the army for service in Lombardy and Flanders. Upon his return to Spain he became attached to the court of Philip IV as a kind of official playwright and master of the revels. For these services he was honored with knighthood in 1636, and later was granted a pension. In order to qualify for a chaplaincy endowed by his maternal grandmother in his parish church, San Salvador, he became a priest in 1651. It is usually stated in biographies of Calderón that he now ceased to write for the secular stage and produced only "autos sacramentales" for the feast of Corpus Christi. Documents published by Pérez Pastor (1905) show, however, that he wrote plays at rare intervals for the royal theatre in the palace of the Buen Retiro. Calderón was by nature a serious and pious man, and his literary production from 1651 on consists almost entirely of "autos sacramentales," most of which were adaptations of his earlier secular plays. In 1653 Philip IV appointed Calderón to a chaplaincy in Los Reyes Nuevos at Toledo, but the absence of the poet from the court proved unsatisfactory to the King, and so in 1663 he made him one of his honorary chaplains at Madrid. On his death, in 1681, all Spain mourned for him. Foreign scholars vied with Spaniards in paying tribute to his memory.

During his long life he had been honored by royalty, and the principal cities of Spain commissioned him annually to write their "autos sacramentales." Many of his plays had been translated into French and Italian. In Spain his dramatic works remained popular until about the middle of the 18th century, when pseudo-classical critics singled him out as the special butt of their attacks on the national drama. In 1763 the performance of "autos sacramentales" was forbidden by law. Calderón's plays were censured for the importance given in them to intrigue, with the consequent neglect of character study. His brilliant, but at times pompous and euphuistic style — especially in plays composed for the royal theatre — also met with disapproval. About the year 1800 romantic critics of Germany, especially Friedrich Schlegel, started a furore for Calderón which made him during two decades the most popular dramatist of modern times. This extravagant enthusiasm for the Spaniard is well exemplified in Shelley, who read his plays "with inexpressible wonder and delight," and was inspired "to throw over their perfect and glowing forms the grey veil of my own words," with what success is seen in his famous, although often inaccurate, rendering of parts of 'The Wonder-Working Magician.' At present, partly because of a natural reaction, and partly because critics like Grillparzer and Menéndez y Pelayo have set up the counterclaim of his more spontaneous and less conventional contemporary, Lope de Vega, Calderón is held in less esteem than formerly.

Calderón's plays can be grouped under five headings, as follows: (1) Religious or sacred plays, to which class belong three of his most successful works, 'The Wonder-Working Magician' (q.v.), 'The Devotion to the Cross' and 'The Firm Prince.' These plays have as their themes conversion from paganism, the repentance of a sinner, who thereby receives pardon, and the fortitude of a Christian hero. (2) Philosophical plays, the best-known being 'Life is a Dream' (q.v.). (3) Tragedies, or so-called honor plays, a representative work of this peculiarly Spanish type of play being 'The Mayor of Zalamea' (q.v.). (4) "Cloak and sword" comedies, plays of intrigue which reflect the customs of the dramatist's age. It was of these plays that Goethe was thinking when he remarked that Calderón's characters are as alike as bullets or leaden soldiers cast in the same mould. In this type of play Calderón was surpassed by Lope de Vega, Tirso de Molina and Alarcón. (5) "Autos sacramentales," in which Calderón was acknowledged a master without a peer. The modern reader is interested only in the few lyrical passages which occur at rare intervals in arid wastes of philosophical or theological discussions and abstractions.

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CALDERÓN Y BELTRAN, Fernando, Mexican dramatist and poet: b. Guadalajara, 20 July 1809; d. Ojocaliente, 18 Jan. 1845. Throughout Spanish America his plays, such as 'The Journey,' 'Anne Boleyn' and 'The Return of the Crusader,' have been extremely popular. As a lyrical poet his work is characterized by dramatic fire, and he is popular, not only in Mexico, but throughout the whole of Spanish America.

CALDERWOOD, David, Scottish clergyman and ecclesiastical historian: b. Dalkeith 1575; d. Jedbury, 29 Oct. 1650. In 1604 he was settled as a minister of Crailing, in Roxburghshire, where he distinguished himself by his opposition to episcopal authority. In 1617 he was banished from the realm for his contumacy and went to Holland, where, in 1623, he published his famous work entitled 'Altare Damascenum'. He returned to Scotland, and became minister of the church of Pencaitland, near Edinburgh, and in 1643 was appointed one of the committee which compiled the directory for public worship in Scotland. He then engaged in writing the history of the Church of Scotland, in continuation of that of Knox, a work which was printed for the Woodrow Society, with a life by the Rev. Thomas Thomson, from his manuscript in 1842–49, in eight volumes.

CALDERWOOD, Henry, Scottish philosopher: b. Peebles, 10 May 1830; d. Edinburgh, 19 Nov. 1897. He received his early education at the Edinburgh Institution and High School. He afterward attended the university of that city, and while a student published his 'Philosophy of the Infinite' (1854), an attempt to controvert the views of Sir William Hamilton. He became minister of Greyfriars United Presbyterian Church, Glasgow, in 1856, and in 1868 was elected professor of moral philosophy in Edinburgh University, a chair which he occupied for the rest of his life. His chief works are his 'Handbook of Moral Philosophy' (1872); 'Relations of Mind and Brain' (1879); 'Evolution and Man's Place in Nature' (1893); 'The Relations of Science and Religion' (1881); and a 'Life of David Hume' (1898). He devoted much of his time to work for educational and temperance reform. Consult the biography (London 1900) by his son, W. C. Calderwood, and D. Woodside, which contains a chapter on Calderwood's philosophy by A. S. Pringle-Pattison.

CALDICOTT, Alfred James, English musician and composer: b. Worcester, England, 1842; d. 24 Oct. 1897. After studying at Leipzig under Richter and Moscheles he was organist of Saint Stephen's Church in his native town for a time, becoming professor in the Royal College of Music in 1882. Among his works, besides many songs, glees, etc., are the cantatas 'The Widow of Nain' (1881) and 'A Rhine Legend' (1883); and the operettas 'A Moss Rose Pent' (1883) and 'Old Knockles' (1884).

CALDWELL, Alexander, American banker: b. Drake's Ferry, Huntington County, Pa., 1 March 1830. He attended public and private schools until 16 years of age. In 1847 he enlisted as a soldier in the Mexican War, entering the company of his father, who was killed at one of the gates of the city of Mexico. In 1848 he returned to Columbia, Pa., where he entered a bank, and later took up business. In 1861 he removed to Kansas, where he engaged in the transportation of military supplies to the various posts on the plains, and became largely interested in railroad and bridge building. He was elected to the United States Senate as a Republican, took his seat 4 March 1871 and served until 24 March 1873, when he resigned. He is president of the Kansas Manufacturing Company and president of the First National Bank of Leavenworth since 1897.

CALDWELL, Charles Henry Bromedge, American naval officer: b. Hingham, Mass., 11 June 1828; d. Boston, 30 Nov. 1877. He did a notable service in an expedition against a tribe of cannibals inhabiting one of the Fiji Islands, defeating them in a pitched battle and destroying their town. In the Civil War he commanded the *Itasca*, taking part in the bombardment of forts Jackson and Saint Philip and the Chalmette batteries, and in the capture of New Orleans. He was promoted commodore in 1874.

CALDWELL, Howard Walter, American historian: b. Bryan, Ohio, 26 Aug. 1858. He was graduated from the University of Nebraska in 1880 and is professor of American history and jurisprudence there. He has written 'History of the United States, 1815–1861' (1896); 'Studies in History' (1897); 'A Survey of American History' (1898); 'Some Great American Legislators' (1899); 'Life of Henry Clay' (1899); 'Expansion of the United States' (1900); 'Education in Nebraska' (1902); 'Civil Government of Nebraska' (1902); 'Source History of the United States' (1909); 'Outlines with References for American History 1783–1877' (1910).

CALDWELL, James, American clergyman: b. Charlotte County, Va., April 1734; d. 24 Nov. 1781. After graduating at the College of New Jersey, now Princeton University, he became Presbyterian pastor at Elizabethtown. During the growing antagonism between the colonies and Great Britain, he warmly took the side of the former, and when hostilities began, became chaplain to the New Jersey brigade, and took an active share in its campaigns, fighting «with the sword in one hand and the Bible in the other.» Irritated at the unexpected and obstinate resistance made by the Jersey troops and yeomanry, the English began to burn the houses and pillage the property of the villagers at Connecticut Farms. In one of the houses was the family of Mr. Caldwell, whose wife had retired to a back room with her two youngest children — one an infant in her arms — where she was engaged in prayer, when a musket was discharged through the window. Two balls struck her in the breast, and she fell dead upon the floor. On 23 June General Knyphausen made a second incursion with about 5,000 troops. On this occasion he passed over the same route to Springfield, where a battle was fought. Among the most active in the fight was the chaplain Caldwell. The British were compelled to retrace their steps, which they did with all possible rapidity. He was shot and killed by an American sentinel in the course of a dispute over a package the latter desired to examine. The soldier was tried and executed for murder later. In 1846 a monument was raised to Caldwell's memory in Elizabeth.

CALDWELL, Joseph, American educator: b. Lammington, N. J., 21 April 1773; d. Chapel Hill, N. C., 24 Jan. 1835. He was graduated at Princeton in 1791, delivering the Latin salutatory, and then taught school in Lammington and Elizabethtown, where he began the study of divinity. He became tutor at Princeton in April 1795, and in 1796 was appointed professor of mathematics in the University of North Carolina. He found the institution, then only five years old, in a feeble state, nearly destitute of buildings, library and apparatus, and to him is ascribed the merit of having saved it from ruin. He was made its president in 1804 and held the office till his death, with the exception of the years from 1812 to 1817. Princeton gave him the degree of D.D. in 1816. In 1824 he visited Europe to purchase apparatus and select books for the library of the university. A monument to his memory has been erected in the grove surrounding the university buildings. He published 'A Compendious System of Elementary Geometry,' with a subjoined treatise on plane trigonometry (1822), and 'Letters of Carleton' (1825).

CALDWELL, William, Scottish-American educator: b. Edinburgh, Scotland, 10 Nov. 1863. He was graduated from the university of his native city and was assistant professor of logic and metaphysics in that institution 1887–88. In 1891 he was called to the Sage School of Philosophy, Cornell University, New York; in 1892 to the University of Chicago, and from 1894 to 1903 he was professor of moral and social philosophy in the Northwestern University at Evanston, Ill. In the latter year he was appointed Macdonald professor of moral philosophy in McGill University, Montreal. He has published 'Schopenhauer's System in Its Philosophical Significance' (1896); 'Pragmatism and Idealism' (1913); and contributions to the leading psychological and philosophical reviews.

CALDWELL, Idaho, city, county-seat of Canyon County on the Oregon Short Line Railroad, 26 miles direct west of Boise. It is in the Payett-Boise Reclamation project, a rich farming region, yielding wheat, flour, cereals, fruits, potatoes and live stock. It has municipally owned waterworks, a Carnegie library, courthouse, city hall, and the College of Idaho is situated here. Here 30 Dec. 1906, ex-Governor Steunenberg was assassinated by Harry Orchard. Pop. 3,543.

CALDWELL, Kan., city in Sumner County, on the Chicago, Rock Island and Pacific, the Atchison, Topeka and Santa Fé and Kansas and Southwestern railroads. The principal industries are the manufacture of ice and flour. There are two banks whose combined resources amount to $1,750,000. The public buildings include two primary and one grade and high schools, a city hall, Carnegie library, opera house. The government is by a commission, and the municipality owns its light and water plants, which have been brought up to date recently at a cost of $95,000. Pop. 2,500.

CALDWELL, N. J., city in Essex County, on the second ridge of the Orange Mountains, 10 miles west of Newark, the county-seat, and on the Erie Railroad. It is mainly a residential city, has two banks with combined resources of $2,000,000, and taxable property of an aggregate value of $3,500,000. There are three public schools and a Carnegie library and town hall. Pop. 3,500.

CALDWELL, Ohio, village, county-seat of Noble County, on the Ohio River and Western and the Cleveland and Marietta railroads, 35 miles north of Marietta. Coal mines and oil wells are worked and the village owns waterworks and electric-lighting plant. Pop. 1,430.

CALDWELL, Tex., town and county-seat of Burleson County, on the Gulf, Colorado and Santa Fé Railroad, 87 miles east-northeast of Austin. It is the trading centre of a stock raising and cotton growing region and has cotton-gin, oil and grist mills, ice-factory and brick yards. Pop. 1,476.

CALEB, son of Jephunneh, a descendant of the tribe of Judah, or according to some authorities a foreigner of Kenezite origin incorporated with that tribe, according to Ussher born 1530 B.C., was sent with Joshua and 10 others to examine the land of Canaan. When Joshua had conquered the country, Caleb reminded the Jews of the promise which had been made by God, that they should enjoy this country. He obtained the city of Hebron for his share of the spoil, besieged and captured it, and drove out three giants, or Anakim. He then marched against Kirjath-sepher, and offered his daughter Achsah to the first who should enter it. Othniel, his nephew, was the successful aspirant for the fair Jewess. Consult Moore, 'Judges' (1895); Myer, ed., 'Die Entstehung des Judentums' (1896); id., 'Die Israeliten und ihre Nachbarstämme' (1906).

CALEB WILLIAMS. 'Caleb Williams,' the best-known novel and most widely read book of William Godwin, published in 1794, embodies many of the ideas of the author's celebrated 'Inquiry Concerning Political Justice.' The hero, from whom the book takes its name, a lad of humble origin but uncommon intelligence, becomes involved in the after effects of a feud between two wealthy and influential country gentlemen, Tyrrel, a brutal, boorish squire, and the more courteous and refined Falkland. Becoming possessed, through an inordinate curiosity, of the secret that his master, Falkland, had murdered Tyrrel and allowed the blame to lie on innocent men, Williams is unrelentingly persecuted by his master. Lodged in jail at Falkland's instigation on charge of felony, the hero, after one unsuccessful attempt, finally escapes, and in the course ot his adventures meets with many classes of society — highwaymen, artisans, «blood-hunters» and magistrates — but never escapes the consequences of Falkland's malevolence. The thesis of the book is the inequality of man before the law. Having innocently incurred the enmity of the influential, Williams cannot henceforth obtain either legal or social redress. The results of injustice are also illustrated among other members of the humbler classes, and a secondary thesis of the book is that many thieves and highwaymen are driven to their mode of life simply through injustice of laws and customs. Falkland's desire to preserve his reputation at all hazards and Tyrrel's exclamation that the lives of 20 such as his ward are not worth one hour of his convenience, are typical of the anti-social feeling that Godwin attacks.

Throughout, the book is written in a vigorous and vivid style, which, in spite of its conscious stateliness, retains vitality and has made it one of the minor classics of English literature. A short account of the relation of 'Caleb Williams' to the theories of the time is to be found in H. N. Brailsford's 'Shelley, Godwin and Their Circle.'

WILLIAM T. BREWSTER.

CALEDONIA, the name by which the portion of Scotland north of the rivers Forth and Clyde first became known to the Romans. The year 80 of the Christian era is the period when Scotland first becomes known to history. The invasion of Cæsar did not immediately lead to the permanent occupation of southern Britain. It was only in the year 43 that the annexation of this portion of the island to the Roman empire began. It was completed superficially about 78, and two years were occupied in reconciling the natives to the Roman yoke. Agricola then moved northward, invading Scotland by the eastern route, and occupying the country up to the line of the Friths of Clyde and Forth. Agricola ran defensive works across this line, and hearing, in the third year of his occupation, rumors of an organized invasion in preparation by the Caledonians, a name applied to the dwellers north of the boundary, he resolved to anticipate them, and again advanced northward. The Roman army marched in three divisions. The weakest, consisting of the ninth legion, was attacked by the barbarians, who fought their way to the Roman camp. Agricola came to the rescue, and the Romans were victorious. The Roman army now advanced to Mons Grampius, where they found the enemy, 30,000 strong, under a chief named Galgacus. Agricola had to stretch his line as far as he deemed prudent to prevent being outflanked. The auxiliaries and Romanized Britons were in the centre and front, the legions in the rear. The Caledonians are described as riding furiously about in chariots between the two camps. Each chief (Roman and Caledonian) made a set speech to his followers; that of Galgacus was peculiarly eloquent. The Caledonians were armed with small shields, arrows and large pointless swords. Their chariots routed the Roman cavalry, but afterward became embarrassed in the broken ground; and when the Roman auxiliaries charged the masses of the enemy with the gladius, they gave way before a method of fighting to which they were unaccustomed. The site of the battle remains undetermined. The name Caledonia is first used by Pliny, who, as well as Tacitus, is supposed to have derived it from Agricola. The name is applied by Ptolemy to one of the numerous populations of North Britain. The use of the name by Tacitus gave it immediate popularity with the Romans and to the same source its subsequent popularity in Britain is to be traced. Caledonia as a name for Scotland has been much used by poets. Consult Smith, 'Dictionary of Greek and Roman Geography'; Burton, 'History of Scotland'; Rhys, 'Celtic Britain.'

CALEDONIA SPRINGS, Canada, town of Prescott County, Ontario, on the Canadian Pacific Railroad, 65 miles west of Montreal, a health resort frequented for its alkaline springs.

CALEDONIAN CANAL, in Scotland, counties of Inverness and Argyle, connects the North with the Irish Sea, extending from Murray Frith through Lochs Ness, Oich and Lochy, in the great glen of Caledonia, to Loch Eli. The total length is 60½ miles, of which the lochs compose 37½. It was built to shorten the distance between Kinnaird's Head and the Sound of Mull, which had offered a very difficult passage. By the canal route the distance was reduced from 500 to 250 miles. It allows passage of ships of 500 to 600 tons. The canal was begun in 1803, and opened for navigation about the close of 1823.

CALEF, Robert, American merchant of Boston: b. about 1648; d. Roxbury, Mass., 13 April 1719. His fourth son, also named Robert, died in 1722 or 1723, aged about 41. One or the other of these men was the author of a remarkable book on the witchcraft delusion in New England. The best authorities, notably James Savage and Wm. F. Poole, ascribe it to the younger, who was about 23 when it appeared. The book was entitled 'More Wonders of the Invisible World' (London 1700), the title being suggested by Cotton Mather's 'Wonders of the Invisible World.' The substance of it had been circulated in manuscript several years previous to its publication and its malicious attacks on Cotton and Increase Mather caused a bitter and life-long quarrel between the former and the author. The book abounds in malicious innuendoes, directly charges the Mathers with inciting and being in full sympathy with the Salem tragedies, and accuses the Boston ministers, in their advice of 15 June 1692, of endorsing the Salem methods. When the book was printed and came back to Boston it was denounced and hated because it was an untruthful and atrocious libel on the public sentiment of Boston, and on the conduct of its ministers. It is said that Increase Mather publicly burned it in the Harvard College yard. The animus of the book has been greatly misunderstood, and the popular idea that Calef was a stalwart agent in putting an end to Salem witchcraft is both a myth and a delusion. Its historical value and the author's character have been greatly overrated. His personal history is a blank which the most assiduous investigation has never been able to fill, or even to supply with the most common details. It is not known where or when he was born, when he died or where he was buried, although he lived in Boston and his will is on file in the Suffolk records. His book has now become very rare and copies bring high prices in the book auctions. It was reprinted at Salem in 1796, 1823 and 1861, and at Boston in 1828 and 1865.

CALENDAR, a system of dividing time into years, months, weeks and days for use in civil life, or a register of these or similar divisions. Among the old Romans, for want of such a register, it was the custom of the pontifex maximus, on the first day of the month, which began with the new moon, to proclaim (*calare*) the month, with the festivals occurring in it. Hence, *calendæ* (the first of the month) and calendar. The periodical occurrence of certain natural phenomena gave rise to the first division of time. The apparent daily revolution of the sun about the earth occasioned the division into days. The time at which a day begins and ends has been differently fixed, the reckoning being from sunrise to sunrise, from sunset to sunset, from noon to noon, or from midnight to midnight. The changes of the moon, which were observed to recur every 29 or 30 days, suggested the division into months, but the month now used, though nearly equal to a lunation, is really an arbitrary unit; and, as a still longer measure of time was found necessary for many purposes, it was supplied by the apparent yearly revolution of the sun round the earth, producing the changing seasons. The time of this revolution is now known to be 365 days, 5 hours, 48 minutes and 46 seconds, but as it has at various times been reckoned differently, this has given rise to corresponding changes in the calendar. This unit of time is called a solar year. The division into weeks, which has been almost universally adopted, is not founded on any natural phenomenon, and, as it originated in the East, has been attributed to the divine command to Moses in regard to the observation of the seventh day as a day of rest. By other authorities it has been ascribed to the number of the principal planets, a theory supported by the names given to the days. It was not used by the Greeks, nor by the Romans, till the time of Theodosius. The great influence of the sun's course upon the seasons naturally attracted the attention of men at all periods to this phenomenon; accordingly all nations in any degree civilized have adopted the year as the longest unit of time. The year of the ancient Egyptians was based on the changes of the seasons alone, without reference to the lunar month, and contained 365 days, which were divided into 12 months of 30 days each, with five supplementary days at the end of each year. The Jewish year consisted of lunar months, of which they reckoned 12 in the year, intercalating a 13th when necessary to maintain the correspondence of the particular months with the regular recurrence of the seasons. The Greeks in the earliest period also reckoned by lunar and intercalary months. They divided the month into three decades, a system also adopted long afterward at the time of the French Revolution. It possesses the advantage of making the smaller division an exact measure of the larger, and under it the number of a day in the 10-day period readily suggests its number in the month. The Greeks in the time of Solon had a year of 12 months alternately of 29 and 30 days, the total number of days being 354, and the year being very nearly equal to a lunar one. Soon afterward a month of 30 days began to be intercalated every other year in order to reconcile their year with that founded on the sun's movement, but as the error was still very large the intercalary month was afterward omitted once in four times. The Jewish and also the Greek year thus both varied in duration according as the intercalary month was introduced or omitted. This, with the uncertainty as to the exact duration of the year, was a constant source of confusion.

Various plans for the reformation of the calendar were proposed from time to time; but all proved insufficient till Meton and Euctemon finally succeeded in bringing it to a much greater degree of accuracy by fixing on the period of 19 years, in which time the new moons return upon the same days of the year as before (as 19 solar years are very nearly equal to 235 lunations). (See CYCLE). This mode of computation, first adopted by the Greeks about 432 B.C., was so much approved of that it was engraven with golden letters on a tablet at Athens. Hence the number showing what year of the moon's cycle any given year is is called the golden number. This period of 19 years was found, however, to be about six hours too long. This defect Calippus, about 102 years later, endeavored to remedy, but still failed to make the beginning of the seasons return on the same fixed day of the year.

The Romans first divided the year into 10 months, but they early adopted the Greek method of lunar and intercalary months, making the lunar year consist of 354, and afterward of 355 days, leaving 10 or 11 days and a fraction to be supplied by the intercalary division. This arrangement, which was placed under the charge of the pontiffs, continued until the time of Cæsar. The first day of the month was called the calends. In March, May, July and October, the 15th, in other months the 13th, was called the ides. The ninth day before the ides (reckoning inclusive) was called the nones. The other days of the months they reckoned forward to the next calends, nones, or ides, whether in the same or the succeeding month, always including both days in the reckoning. Thus the 3d of March, according to the Roman reckoning, would be the fifth day before the nones, which in that month fell on the 7th. The 8th of January, in which month the nones happen on the 5th, and the ides on the 13th was called the 6th before the ides of January. Finally to express any of the days after the ides, they reckoned in a similar manner from the calends of the following month. From the inaccuracy of the Roman method of reckoning it appears that in Cicero's time the calendar brought the vernal equinox almost two months later than it ought to be. To check this irregularity Julius Cæsar invited the Greek astronomer Sosigenes to Rome, who, with the assistance of Marcus Fabius, invented that mode of reckoning which, after him who introduced it into use, has been called the Julian calendar. The chief improvement consisted in restoring the equinox to its proper place in March. For this purpose two months were inserted between November and December, so that the year 707 (46 B.C.), called from this circumstance the year of confusion, contained 14 months. In the number of days the Greek computation was adopted, which made it 365¼. The number and names of the months were kept unaltered with the exception of Quintilis, which was henceforth called, in honor of the author of the improvement, Julius. To dispose of the quarter of a day it was determined to intercalate a day every fourth year between the 23d and 24th of February. This was called an intercalary day, and the year in which it took place was called an intercalary year, or, as we term it, a leap year.

This calendar continued in use among the Romans until the fall of the empire, and throughout Christendom till 1582. The festivals of the Christian Church were determined by it. With regard to Easter, however, it was necessary to have reference to the course of the moon. The Jews celebrated Easter (that is, the Passover) on the 14th of the month Nisan (or March); the Christians in the same month, but always on a Sunday. Now, as the Easter of the Christians sometimes coincided with the Passover of the Jews, and it was thought unchristian to celebrate so important a festival at the same time as the Jews did, it was resolved at the Council of Nice, 325 A.D., that from that time Easter should be solemnized on the Sunday following the first full moon after the vernal equinox, which was then supposed to take place on 21 March. As the course of the moon was thus made the foundation for determining the time of Easter, the lunar Cycle of Meton was taken for this purpose; according to which the year contains 365¼ days, and the new moons, after a period of 19 years, return on the same day as before. The inaccuracy of this combination of the Julian year and the lunar cycle must have soon discovered itself on a comparison with the true time of the commencement of the equinoxes, since the received length of 365¼ days exceeds the true by about 11 minutes; so that for every such Julian year the equinox receded 11 minutes, or a day in about 130 years. In consequence of this, in the 16th century, the vernal equinox had changed its place in the calendar from the 21st to the 10th; that is, it really took place on the 10th instead of the 21st, on which it was placed in the calendar. Luigi Lilio Ghiraldi, frequently called Aloysius Lilius, a physician of Verona, projected a plan for amending the calendar, which, after his death, was presented by his brother to Pope Gregory XIII. To carry it into execution, the Pope assembled a number of prelates and learned men. In 1577 the proposed change was adopted by all the Catholic princes; and in 1582 Gregory issued a brief abolishing the Julian calendar in all Catholic countries, and introducing in its stead the one now in use, under the name of the Gregorian or reformed calendar, or the new style, as the other was now called the old style. The amendment ordered was this: 10 days were to be dropped after 4 Oct. 1582, and the 15th was reckoned immediately after the 4th. Every 100th year, which by the old style was a leap year, was now to be a common year, the 4th century divisible by four excepted; that is, 1600 was to remain a leap year, but 1700, 1800, 1900 of the common length, and 2000 a leap year again. In this calendar the length of the solar year is taken to be 365 days, 5 hours, 49 minutes and 12 seconds, the difference between which and the true length is immaterial. In Spain, Portugal and the greater part of Italy the amendment was introduced according to the Pope's instructions. In France the 10 days were dropped in December, the 10th being called the 20th. In Catholic Switzerland, Germany and the Netherlands the change was introduced in the following year, in Poland in 1586, in Hungary 1587. Protestant Germany, Holland and Denmark accepted it in 1700, and Switzerland in 1701. In the German empire a difference still remained for a considerable time as to the period for observing Easter. In England the Gregorian calendar was adopted in 1752, in accordance with an act of Parliament passed the previous year, the day after 2d September becoming the 14th. Sweden followed in 1753. Russia and Greece still adhere to the Julian calendar, which, by the interjection of two more days, 1800 and 1900 being regarded as leap years, now differs from the Gregorian calendar by 13 days. Thus 14 Jan. 1917 of the new style will be 1 Jan. 1917 in Greece and Russia.

The change adopted in the English calendar in 1752 embraced another point. There had been previous to this time various periods fixed for the commencement of the year in various countries of Europe. In France, from the time of Charles IX, the year was reckoned to begin from 1 January; this was also the popular reckoning in England, but the legal and ecclesiastical year began on 25 March. The 1st of January was now adopted as the beginning of the legal year, and it was customary for some time to give two dates for the period intervening between 1 January and 25 March, that of the old and that of the new year, as January 1752–53.

In France, during the Revolutionary epoch, a new calendar was introduced by a decree of the National Convention, 24 Nov. 1793. The new reckoning was to begin with 22 Sept. 1792, the day on which the first decree of the new republic had been promulgated. The year was made to consist of 12 months of 30 days each, and, to complete the full number, five *fête* days (in leap year six) were added at the end of the year. Instead of weeks, each month was divided into three parts, called decades, consisting of 10 days each; the other divisions being also accommodated to the decimal system. This calendar was abolished at the command of Napoleon, by a decree of the Senate, 9 Sept. 1805, and the common or Gregorian calendar was re-established on 1 January of the following year. The Mohammedans employ a lunar year of 354 days and 12 lunar months, which have alternately 29 and 30 days. Thirty years form a cycle and 11 times in every cycle an extra day is added at the end of the year. The months and the seasons do not correspond and the first of the year may fall at any time during the solar year. The months are named Muharram, Saphar, Rabia I, Rabia II, Jomadi I, Jomadi II, Rajab, Shaaban, Ramadan, Shawall, Dulkaada and Dulkeggia. The Mohammedan era is computed from the first day of the year of the Hejira, or flight of Mohammed to Medina. It corresponds with 15 July 622 of the Christian era. The Mohammedan year which began on 28 Oct. 1916 was the 15th year of the 45th cycle, or the year 1335 of the Mohammedan era. See also CHRONOLOGY; CYCLE; EPOCH; HEJIRA.

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CALGARY, Canada. The city of Calgary is situated in the province of Alberta, at the junction of the Bow and Elbow rivers, 840 miles west of Winnipeg, and 2,262 miles west of Montreal. The site is picturesque, as the city lies in a species of natural bowl. From Calgary, the Rocky Mountains 80 miles away are clearly visible. Before the advent of the Canadian Pacific Railway 30 years ago, Calgary was an important trading post and headquarters for the ranching country of southern Alberta. With the establishment of through transcontinental communication, Calgary assumed a place on the map and rapidly began to develop commercially.

Situated as it is at the entrance of two great passes through the mountains and surrounded by both a fine agricultural and ranching country, Calgary has naturally become an important railway centre. Lines belonging to the Canadian Pacific run north to Edmonton and south via Lethridge through the Crow's Nest Pass. The city is also served by the lines of the Grand Trunk Pacific and the Canadian Northern.

The city has an altitude of 3,410 feet above sea-level, and enjoys a bracing and healthful climate. The average temperature is 35.2 and the rainfall 19 inches. While low temperatures are of regular occurrence in the winter, the climate is agreeably modified by the warm Chinook winds which frequently bring a cold spell to a sudden and welcome close.

Buildings.— Calgary is a very substantially built city, and is fortunate in having nearby extensive quarries of excellent sandstone. Calgary stone, as it is called, has been used with excellent effect in the Provincial Parliament Buildings at Edmonton. Handsome public and office buildings and business blocks line the downtown streets. Knox Presbyterian Church, built of Calgary stone, is one of the finest specimens of ecclesiastical architecture in western Canada.

Government.— Calgary was founded in 1883 and incorporated in 1894. Its municipal government consists of an elective mayor and council and an elective board of commissioners. Calgary employs a slightly modified form of the single tax. The city owns its own electric street railway, with 60 miles of trackage in operation. It operates its own gravity water system and sewerage system, and owns its own asphalt paving plant. Natural gas sells for 35 cents per 1,000 cubic feet, and at 15 cents for power. Water power has also been brought in and of this 31,100 horse power is already available.

Religion and Education.— Calgary is the seat of Anglican and Roman Catholic bishoprics, and all the leading religious denominations are well established. Educational facilities are amply and generously provided. There are 32 public and high schools, four Roman Catholic separate schools and a Normal School. The provincial government opened in 1916 an Institute of Technology and Manual Arts.

Industrial Progress.— Western Canada is substantially an agricultural country, but Calgary has had a considerable industrial development, and is the chief distributing centre between Winnipeg and the Pacific. Though coal is not mined in the immediate vicinity, it is worked on an extensive scale at Lethbridge and Bankhead, both of them points within 100 miles. Natural gas has been piped into the city from Bow Island, 100 miles distant. Oil was discovered in 1914 a short distance south of Calgary, and the indications are promising. The foothills of the Rockies to the west form an admirable grazing country and large herds of stock are raised. These contribute the raw material for the successful stockyards and extensive packing plants which are amongst Calgary's most important industries. Excellent clays for brickmaking exist. Calgary is the site of one of the Dominion government's great interior storage elevators and has become an important centre in the grain trade. Large milling establishments flourish. Manufactures include biscuits, boxes and breakfast foods. A large business is carried on in building materials, harness and leather goods, iron and metals, aerated waters, beer, etc. The Canadian Pacific has erected at Calgary car shops costing over $3,500,000, with an annual wage bill of

$3,400,000. Pop. (1911) 43,704; special Dominion census of 1916, 55,000.

WILLIAM A. R. KERR,
Dean of the University of Alberta.

CALHOUN, kăl-hoon′, **John Caldwell,** American statesman: b. Abbeville District, S. C., 18 March 1782; d. Washington, D. C., 31 March 1850. He was graduated with distinction at Yale College in 1804, and was admitted to the South Carolina bar in 1807. After serving for two sessions in the legislature of his native State, he was elected to Congress in 1811. From that time until his death, a period of nearly 40 years, he was seldom absent from Washington, being nearly the whole time in the public service, either in Congress or in the Cabinet. When he first entered Congress the disputes with England were fast approaching actual hostilities, and he immediately took part with that portion of the dominant party whose object was to drive the still reluctant administration into a declaration of war. They succeeded, and, as a member of the Committee on Foreign Relations, he reported a bill for declaring war, which was passed in June 1812. When Monroe formed his administration in 1817, Calhoun became Secretary of War, a post which he filled with great ability for seven years, reducing the affairs of the department from a state of great confusion to simplicity and order. In 1824 he was chosen Vice-President of the United States under John Q. Adams, and again in 1828 under General Jackson. In 1828, a protective tariff was enacted which bore very heavily on the agriculturists of the South and hence was known throughout that section as "The Tariff of Abominations." Mr. Calhoun prepared a paper declaring that the "United States is not a union of the people, but a league or compact between sovereign states, any of which has the right to judge when the compact is broken and to pronounce any law to be null and void which violates its conditions." This paper was issued by the legislature of South Carolina and was known as ‘The South Carolina Exposition.’ This view of the United States constitution as a compact between the States had been many years before strongly expressed in the Virginia and Kentucky resolutions, the former being drawn up by James Madison, often styled the "Father of the Constitution," and the latter by Thomas Jefferson. The Kentucky resolutions had suggested nullification as a remedy. Alexander Hamilton in *The Federalist* frequently spoke of the United States as a "Confederate Republic" and a "Confederacy" and called the constitution a "compact." Washington frequently referred to the constitution as a "compact," and spoke of the Union as a "Confederated Republic." At the time of the Louisiana Purchase Hon. Timothy Pickering of Massachusetts advocated the right and advisability of secession and Hon. Josiah Quincy of the same State in 1811 expressed similar views. Hence John C. Calhoun propounded no new or strange doctrine, but one which had found advocates before, and in the North as well as in the South.

In 1828, the friendly relations between Mr. Calhoun and President Jackson were broken off, when the latter ascertained that Calhoun had sought to have him called to account for his acts in the Seminole War. This breach was still further enlarged when Calhoun refused to co-operate with President Jackson in the effort to reinstate Mrs. Eaton in Washington society.

When Mr. Calhoun found that the repeal of the tariff of 1828 could not be secured through President Jackson, he resigned the Vice-Presidency and entered the Senate from South Carolina. On 26 July 1831 he published a paper favoring free trade and declaring that the "great conservative principle of Union is nullification." The tariff question was settled by a compromise in ~~1832.~~ 1833

Mr. Calhoun feared that the slavery quarrel would some day disrupt the Union and therefore endeavored to check all discussion of this issue. He opposed Jackson's removal of the funds from the National Bank and also assailed the "spoils system." He supported Van Buren's "sub-treasury system," favored his re-election and secured for him the electoral vote of South Carolina. He defended Tyler for vetoing the recharter of the United States Bank and as Secretary of State under that President was largely instrumental in bringing about the annexation of Texas. He regretted the division of the Union into sections, but, recognizing a fact which already existed, he advocated a dual executive, one from the North, the other from the South, each having the power to veto an act approved by the other; thus preventing the passage of any law offensive to either section. His motive in this was the preservation of the Union, which he dearly loved.

He died 31 March 1850, having spent the last few months of his life in writing his ‘Disquisition on Government’ and his ‘Discussion on the Constitution and Government of the United States’ which has been pronounced the most remarkable discussion of the rights of minorities ever written. Mr. Calhoun was of attractive personality and of irreproachable character, to which Daniel Webster testified in his grand eulogy on the great South Carolinian.

His ‘Collected Works’ appeared 1853–54, and his correspondence, edited by Jameson, in 1900. Consult Lives by Jenkins (1851); Von Holst (1882); Benton, ‘Thirty Years’ View’ (1854); Dodd, ‘Statesmen of the Old South’ (New York 1911); Hunt, ‘J. C. Calhoun’ (Philadelphia 1908); Peck, H. C., ‘The Jacksonian Epoch’ (1906); Peck, H. T., ‘American Party Leaders’ (New York 1914); and Calhoun's correspondence, edited by J. F. Jameson (1900).

J. T. DERRY,
Author, History of Georgia.

CALHOUN, Simon Howard, American Congregational missionary, linguist and translator: b. Boston 1804: d. 1876. A graduate of Williams College in 1829, from 1836 to 1874 he labored as a missionary in the Levant and Syria. An expert in Turkish and Arabic he collaborated with William Goodell on the first Turkish translation of the Bible.

CALHOUN, William James, American diplomat: b. Pittsburgh, Pa., 5 Oct. 1848. He practised as a lawyer at Danville, Ill., from 1875 to 1898, when he removed to Chicago to become senior member of the law firm of Calhoun, Lyford & Sheean. In 1897 President McKinley had appointed him special commissioner to

Cuba and in 1898, member of the Interstate Commerce Commission. President Roosevelt appointed him special commissioner to Venezuela in 1905 and he served as Minister to China from 1909 to 1913. The subsequent Chinese policy of President Wilson was severely criticised by him.

CALI, ka-lē′, Colombia, South America, a city near the confluence of the Cali and Cauca rivers in the department of Cauca, and north of Popayán, the capital of that department. It is one of the ancient cities of the republic (founded in 1536) and to-day is important on account of its location in an agricultural district and on the Pacific Railway, from Buenaventura to Cali and thence through the Cauca Valley, a total distance of 108.1 miles. Cali is also connected by a short steam tramway with the Cauca River. Pop. 27,747.

CALICE, Count **Heinrich**, Diplomatist, ambassador and linguist of international fame: b. August 1831; d. Goerz, 28 Aug. 1912. His first activities began in the year 1857 when he was appointed consul for the Dual Monarchy at Constantinople. Later he served in Liverpool, China and Japan. In 1876, while the Serbian War was in progress, he was sent with full powers, by Count Andrassy, as the Austro-Hungarian representative, to the eventful conference that ended in initiation of hostilities between Russia and Turkey. At the conference Count Ignatieff, the Russian Plenipotentiary, strongly urged armed entry into Serbia, but was resisted by Lord Salisbury, supported by Count Calice. In 1880 Baron Calice was appointed Austrian Ambassador to the Porte,— which position he held for 26 years. Notwithstanding the fact that he presented four ultimatums to Turkey, he was at all times a trusted friend of the ex-Sultan. Baron Calice was the oldest active diplomatist in Europe, and became the dean of the diplomatic corps in Constantinople.

CALICO-PRINTING, the art of producing on calico or cotton cloth variegated patterns by the process of printing; the object, as a rule, being to have the colors composing the designs as fast as possible to washing and other influences. It is similar to the art of dyeing, but differs from it in so far that the coloring matters are fixed on certain parts of the fabric only, to form a pattern. Linen, wool and silk fabrics are printed in a similar manner, but less extensively. The origin of the art of printing is probably coeval with that of dyeing (q.v.). India is generally regarded as the birthplace of calico-printing, and the word calico is derived from the name of the Indian town Calicut, where it was at one time extensively manufactured and printed. Calico-printing, as an Egyptian art, was first described by Pliny in the 1st century. Indian printed chintz calicoes were introduced into Europe by the Dutch East India Company, and the first attempts at imitating them in Europe are said to have been made in Holland, but at what exact date is uncertain. The art, however, soon spread to Germany and England, where it is said to have been introduced about 1676, two of the earliest works being situated at Richmond on the Thames, and at Bromley Hall, Essex. In 1738 calico printworks were established in Scotland in the neighborhood of Glasgow, and in 1764 at Bamber Bridge, near Preston, in Lancashire. At the present time the chief seats of the calico-printing trade in Great Britain are still in the neighborhood of Glasgow and Manchester. The chief European seat of calico-printing is Mülhausen, in Germany, and it is practised in various towns in France, Austria, Russia, Switzerland, Holland and the United States.

Calico-printing is of a highly complex character, and enlists not only the co-operation of the arts of designing, engraving, bleaching and dyeing, but also an important element of success, the science of chemistry.

The first operation to which the gray calico is submitted, as it comes from the loom, is that of singeing. This consists in burning off the loose downy fibres from the surface by passing the pieces rapidly, in an open and stretched condition, over red-hot plates or a row of smokeless Bunsen gas flames. The object of singeing is to obtain a smooth printing surface on the calico, thus ensuring the production of clear, sharp impressions during the printing process. The next operation is that of bleaching, which consists in boiling the fabric with weak alkaline solutions, followed by a treatment with cold dilute solutions of bleaching-powder and acid, interspersed with frequent washings with water. By these means the natural impurities of the cotton are removed, and the calico ultimately presents a snow-white appearance. A number of pieces are now stitched together, wrapped on a wooden roller, and passed through a so-called shearing machine, in which, by means of a spiral cutter similar to that in a lawn-mower, any projecting knots, loose fibres or down are finally removed. In this condition the calico is ready for the printer.

The printing of the patterns upon the cloth may be carried out in various ways, the earliest method being by means of wooden blocks, on which the figures of the patterns stood out in relief. Where several colors were employed in one pattern, a block for each color was necessary. In a set of blocks for one pattern, each block, although at first having the same design drawn upon it, was cut in such a manner that it ultimately transferred only a single color, which appeared in different parts of the pattern. When all the blocks had been applied, the various colors printed completed the original design. To ensure accurate juxtaposition of the colors, each block was furnished with brass points at the corners, in order to guide the workman. The printer first furnished the face of the block with the requisite color by pressing it several times on a piece of woolen cloth suitably stretched and supported on a so-called color-sieve, and which had been previously brushed over with color by a boy attendant. The printer then applied the block to the surface of the calico, which was stretched on a long table covered with felt, striking the back of the block with his hand or with a small mallet. The operation of block printing was slow and tedious and though many improvements have been introduced, and it can even be effected by mechanical power, as in the so-called Perrotine machine, it is now only employed to a very limited extent for certain special kinds of work. Another mode of printing, introduced about 1760, is by means of engraved copper-plates, but its employment is also similarly restricted.

The modern method of printing, which dates from 1785, is effected by means of engraved copper cylinders, and this method has now practically superseded all others.

The method of engraving employed varies according to the kind of pattern to be put on the roller. In the case of very large patterns the figures are engraved by hand on the cylinders themselves with the use of the ordinary tools of the copper-plate engraver. For smaller designs, however, which are often repeated, it is usual in the first instance to engrave the pattern by hand on a very small cylinder of soft steel in intaglio, just as it will ultimately appear on the copper. This steel cylinder, which is called a die, is then tempered to a high degree of hardness, and by means of machinery is pressed against another cylinder of soft steel, on which the pattern is thus made to appear in relief. This last cylinder, called the mill, is then hardened, and, being pressed against the copper cylinder, the figures are indented and the roller is ready for use. In the first instance the original pattern of the designer has always to be reduced or enlarged, so as to repeat an exact number of times over the roller to be engraved. In order to reduce the amount of skilled labor one repeat only of the pattern is engraved on the die; the mill, which is of larger diameter, has two, three or four repeats; while the number of repeats on the circumference of the copper cylinder is still greater. A third method of engraving, which has now largely superseded the foregoing, is that of etching, in conjunction with the pantograph system of transferring the design to the copper roller. The roller, being coated uniformly with a bituminous varnish, has the pattern traced on the varnish in the pentagraph machine by a set of diamond points, and it is then submitted for a very brief period to the action of nitric acid. In the parts where the pattern has been traced the varnish is removed, there the copper is speedily attacked by the acid, and the pattern is thus etched upon it. After removing the varnish the roller is ready for printing.

The cylinder printing machine consists of a large central iron drum, around which are arranged one or more engraved copper rollers, according to the number of colors to be printed simultaneously. Each roller is provided with the means of making several adjustments, in order to determine the exact position of the color which it prints. The central drum is wrapped with cloth, and it is further provided with an endless blanket and back-cloth, so as to present a yielding surface to the printing rollers. The cloth to be printed passes from a roll behind the machine, round the central drum in a tightly stretched condition, while the several printing rollers press forcibly against it. Each roller, as it revolves, is fed with color from a small trough below, the superfluous color being scraped off the plain surface of the roller by means of a sharp-edged steel blade, or "doctor," thus leaving the color only in the engraved portions. As the rollers thus charged with color press against the cloth, the latter absorbs or withdraws the color from the engraving, and the pattern is thus transferred to the calico. By this machine as much work can be performed in three minutes as could be done by block-printing in six hours. After the cloth has received the impression from the rollers it passes over a series of steam-heated flat irons, chests or cylinders, and is thus dried.

In close connection with the printing-machine department is the so-called color-house or color-shop, where the solutions of coloring matters are suitably thickened and made ready for the printer. The color-house is provided with numerous steam-heated copper pans, so arranged on supports that they can be readily turned over for emptying or cleaning. The color mixtures are stirred with wooden blades by hand, or by mechanical agitators, and carefully strained through cloth before use. The thickening of the color solutions with starch, flour, gum, dextrine, albumen, etc., is necessary to prevent the spreading of the color by capillary attraction beyond the printed parts, and thus ensure sharp and neat impressions. Near the color-house is a chemical laboratory, and a drug room containing the store of coloring matters, dyewood, extracts, thickenings, chemicals, etc.

The various classes or styles of calico-prints are usually arranged either according to the chief dyestuffs employed or their mode of application. Each of these primary styles may be further separated into subdivisions, of which the most important are the discharge and resist styles, which refer to the manner in which the pattern is produced. The following include the chief styles of calico-prints at present in vogue:

Madder Style.— This is so named because the chief dyestuff formerly employed in it was madder. This dyestuff belongs to the class of so-called mordant-colors. Such dyestuffs are worthless if employed alone by the calico-printer and only furnish useful colors if applied in conjunction with certain metallic salts or mordants, of which the chief ones here employed are the acetates of aluminum and iron. At first the pattern is printed on the white calico with these or similar mordants alone, and only after they have been suitably fixed is the madder or other similar coloring matter applied in the dye-bath, where for the first time the desired colored pattern appears. The aluminum mordant yields red and pink, iron yields purple or black, a mixture of iron and aluminum yields chocolate, etc. The fixing of the mordant after printing and drying is effected by passing the printed calico through the so-called ageing-machine, a large chamber suitably heated and charged with moisture, where the acetic acid of the printed mordants is driven off, leaving the aluminum salt in an insoluble form on the calico. A more complete fixing of the mordant is subsequently effected by passing the fabric through solutions containing silicate or arseniate of soda, and a final washing completes its preparation for dyeing. The dyeing operation consists in boiling the fabric in a solution or decoction of the requisite dyestuff. After dyeing, the stained unprinted portions are cleaned and purified, while the printed colors are rendered more brilliant by washing, soaping, coloring, etc. Variety of effect is produced by printing the same fabric two or three times (print, cover, pad) with various designs before proceeding to the ageing, etc. If in the first instance a portion of the pattern is printed with lime-juice (citric acid), it resists or prevents the fixing of the mordants applied over it in the second and third printings, and the part remains undyed and appears as a so-called resist white. In a similar manner stannous chloride, mixed with aluminum acetate before printing, resists the fixing of iron mordants printed over the aluminum mordant, and a resist red pattern under a purple cover is obtained, presuming madder to be the dyestuff employed. Alizarin now replaces the madder formerly used, and similar variegated effects are obtained if other mordant dyestuffs are employed, for example, cochineal, quercitron bark, etc. Formerly a preparation of madder, termed garancine, was largely employed, and gave rise to the garancine style, in which the colors were fuller and darker, the prevailing hues being browns, chocolates, drabs, etc. Since the range of colors yielded in the madder style is limited, additional colors, as green, blue or yellow, may be printed in by block after dyeing, etc., and are fixed by steaming. If the whole fabric is evenly impregnated with mordant by means of a "padding-machine" and dried, and then a pattern is printed over the mordant with lime-juice, the mordant is removed or discharged in the printed parts, and remains white in the subsequent dyeing. Such a print would be termed a padded style with discharge white.

Steam Style.— Many coloring matters, differing from each other widely in character, are fixed by the operation of steaming instead of by dyeing, so that this style is somewhat varied in character. Ordinary steam-colors consist of a thickened mixture of dyewood extract and mordant, with the addition of assistant metallic salts and acids. The mixture is printed upon the white calico, which, after drying, is exposed from a half to one hour in closed chambers to the action of steam. This steaming operation effects the combination of the coloring matter and mordant, and the color is thus developed and at the same time fixed upon the calico. Black is produced with logwood extract and chromium acetate, scarlet is produced with cochineal extract and stannous chloride. The prints are washed and dried after steaming, the colors being usually bright, but not very fast. Steam-colors, fast to light and soap, are obtained in a similar manner by printing mixtures of alizarin and allied coloring matters with mordants, and then steaming. These are used in the so-called madder extract or steam alizarin style, in which red, pink, purple, etc., appear. In the pigment style use is made of pigments, or insoluble colored mineral powders as ultramarine-blue, chrome yellow, Guignet's green, etc. These are mixed with a solution of egg or blood albumen, printed and steamed. The albumen coagulates on steaming, and thus adheres firmly to the cloth, at the same time enclosing the pigments within the coagulum. Such colors are fast to light and soap, and may therefore be printed simultaneously with the steam alizarin colors for the production of variegated fast prints. Another class of colors are the so-called basic colors, as magenta, aniline blue, etc. Their solutions may also be thickened with albumen, printed and steamed, to give fast steam-colors. It is more usual, however, to print a mixture of the thickened color solution and tannic acid, and to pass the steamed print through a boiling solution of tartar emetic. By this means an insoluble color-lake (tannate of antimony and color-base) is fixed on the calico, which is fast to soaping but not to light. Basic colors applied in this manner are now usually printed along with the steam alizarin colors, instead of pigments, thickened with albumen, and variegated fast prints are thus obtained. Loose pigment colors are basic colors thickened with starch or gum tragacanth only, and then steamed. Such prints do not even stand washing with cold water.

Turkey-red Style.— In this style use is made of the fact that turkey red is at once bleached by the action of chlorine. Plain dyed turkey-red calico is printed with tartaric acid, dried and passed through a solution of bleaching-powder. In the printed parts chlorine gas is evolved, the red is destroyed and a white discharge pattern is produced. A blue pattern results if Prussian blue is added to the printing mixture; yellow is obtained if a lead salt is added, and the fabric is afterward passed through bichromate of potash solution, whereby yellow chromate of lead is produced; green results from a mixture of the blue and yellow; black is printed direct. These and other discharge colors may also be obtained by other methods.

Indigo Style.— Of the numerous indigo styles in use it is only possible to refer to one or two of the most important. Indigo blue patterns on a white ground are obtained by printing a thickened mixture of finely-ground indigo and caustic soda on white calico, previously impregnated with glucose. A subsequent steaming reduces the indigo to indigo white, and causes it to penetrate the fibre, while a final washing oxidizes, regenerates and fixes the color. A resist white pattern on a blue ground is obtained by first printing upon white calico a resist paste composed of gum or flour, China clay, sulphate of copper, etc. When the printed calico is dyed in the indigo vat the paste resists the entrance of the color, partly in a mechanical and partly in a chemical manner, hence the blue is only fixed in those parts which are unprotected by the paste, after the removal of which by washing, the white pattern appears. Various resist colors, as yellow, green, etc., are obtained by the addition of different chemicals to the paste and altering the after-processes. A discharge white pattern on a blue ground is obtained by printing on plain indigo-blue dyed calico a solution of bichromate of potash thickened with gum, and then passing the fabric through a solution containing sulphuric and oxalic acids. During this passage there is liberated, in the printed parts only, chromic acid, which at once oxidizes and destroys the blue, producing the desired white pattern. Colored discharge patterns are produced similarly by employing albumen thickening instead of gum thickening, and adding to the printing mixture such pigments as are not affected by acids, for example, vermilion, chrome yellow, Guignet's green, etc.

This method is now being superseded by the Freiberger process, a simpler and more productive way of discharging, the reagents used being either chromic acid, sodium chlorate or, in some cases, bromate and, still more recently, nitrates. This latter method passes the cotton fabric imprinted with nitrate discharging color through hot and concentrated sulphuric acid and, by accurate control of the strength, temperature and time exposed, not only preserves the fabric in undiminished strength but obtains the most accurate and permanent discharge effects.

Bronze Style.— Manganese brown or bronze is decolorized by reducing agents; hence white discharge patterns on a bronze ground are obtained by printing plain manganese-brown-dyed calico with a mixture of stannous chloride and oxalic acid, and then steaming. Colored discharge patterns are obtained if coloring matters are added to the printing mixture which are not affected by reducing-agents, or which even require stannous chloride as a mordant to develop the color as Prussian blue, chrome yellow, Persian-berry yellow, Brazil-wood pink, safranine, acridine orange, etc.

Aniline Black Style.— Aniline black being a product of the oxidation of aniline, patterns in this color on a white ground are obtained by printing a thickened solution of aniline hydrochloride containing the oxidizing agent, sodium chlorate, and a salt of copper or vanadium. When the printed fabric is slightly steamed or exposed to a moist, warm atmosphere, the impression, which is at first devoid of color, gradually becomes dark green, and this by a final treatment with an alkaline solution, soap, etc., changes at once to a rich black. The color is extremely fast to light, alkalis, acids, etc., and it is largely employed by the printer, both alone and in conjunction with dyed or steam colors. The development of the black during the ageing or oxidizing process occurs only in the presence of a mineral acid, hence resist whites are obtained by first printing the design on the white calico with thickened solutions of substances of an alkaline or reducing character or salts of organic acids, as acetate of soda, and then printing or padding over all with the aniline black mixture, ageing, steaming, etc. Where the design is printed the alkalinity entirely prevents the development of the black. Pigment colors thickened with albumen, also certain benzidine colors, containing an admixture of chalk, acetate of soda, etc., are largely employed in this manner. These resist colors may also be printed immediately after the application of the aniline black mixture, before the development of the color by ageing.

Azo Color Style.— The so-called insoluble azo colors result from the interaction of an azo compound and a phenol. Two methods of printing based upon this principle are employed. One method is to print the design with a thickened solution of β-naphthol on the white calico, and then pass the fabric through a very cold solution of the azo compound (developing-bath), when the design at once appears in a color corresponding to the azo compound employed. Another method is to print the design with a thickened solution of the azo compound upon calico which has been previously impregnated with a solution of sodium-naphthol and dried; in this case the color of the design is developed in the moment of impression. The necessary azo compounds are obtained by the action of nitrous acid, on salts of amido substances for example, paranitraniline, naphthylamine nitrotoluidine, dianisidine, etc., each of which yields a distinct color, bright red, claret red, orange, blue, etc. The naphthol-prepared cloth and also the azo compounds are somewhat unstable, so that this style is not successfully printed without considerable care. The insoluble azo colors, also the direct or benzidine colors, are capable of furnishing discharge patterns, since, in common with the azo colors generally, they are readily decomposed and destroyed by reducing-agents. It suffices to print calico dyed with these colors, as benzopurpurine, chrysophenine, benzoazurine, Mikado brown, etc., with a mixture containing stannous acetate, zinc powder, or other similar reducing-agent, and then steam the printed fabric, to obtain white discharge patterns. If there be added to the printing mixture such mordants and coloring matters as are not affected by reducing-agents, for example, safranine, auramine, etc., a variety of colored discharges are obtained, exactly as in the bronze style. Many of the benzidine colors may also be printed direct on white calico to furnish color designs, but such prints are not particularly fast to washing.

A newer method of printing on cloth by a lithographic process has recently been invented. The principle involved is printing lithographically upon the fabric with lithographic, or oil, colors and dispensing with the practice of fixing the colors after printing, which is essential when aniline or allied colors are used. The actual process is continuous, as in ordinary calico printing, but instead of ordinary copper rollers being used for impressing the pattern the effects are obtained by the use of continuous metal plates, or tubes, upon which the designs are transferred directly in the manner employed in ordinary lithographic printing on paper. It is said to cheapen production greatly, for as soon as an order is completed of one design, the rollers may be cleaned and fresh patterns immediately transferred.

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CALIFORNIA, principal Pacific Coast State of United States (No. 31 in order of admission), bounded north by Oregon, south by Mexico (Lower California), east by Nevada and Arizona, west by Pacific Ocean. Extreme length about 800 miles, coast line 1,097 miles, greatest width about 270 miles. Area (No. 2 in United States), 158,360 square miles (2,380 water). Pop. (1910) (No. 21 in United States) 2,377,549, an increase of 892,496 (60.1 per cent) since the census of 1900. Pop. (1916) 2,938,654, an increase of 561,105 (23.6 per cent) in six years.

Topography and Climate.— Its peculiar shape, determined less by political than by natural delimitations, gives California a character unique among the States, climatically and economically. It has a range of climate all its own, and its boundaries include all the climates in North America. It is longest of the States; and, in proportion to its length, narrowest. It corresponds with an area which upon the Atlantic seaboard should run as far inland as does South Carolina, and as long coastwise as from Charleston to Boston. This in itself gives large range of climate by latitudes; but its topography and its colimitations greatly increase this range. Its peculiar projection or «leaning out» upon the Pacific; its enormous coast line (somewhat less than one-fifth total coastline of the United States); and particularly its «exposure» to the west and south upon this great

CALIFORNIA

Estimated population, 3,119,412

COUNTIES

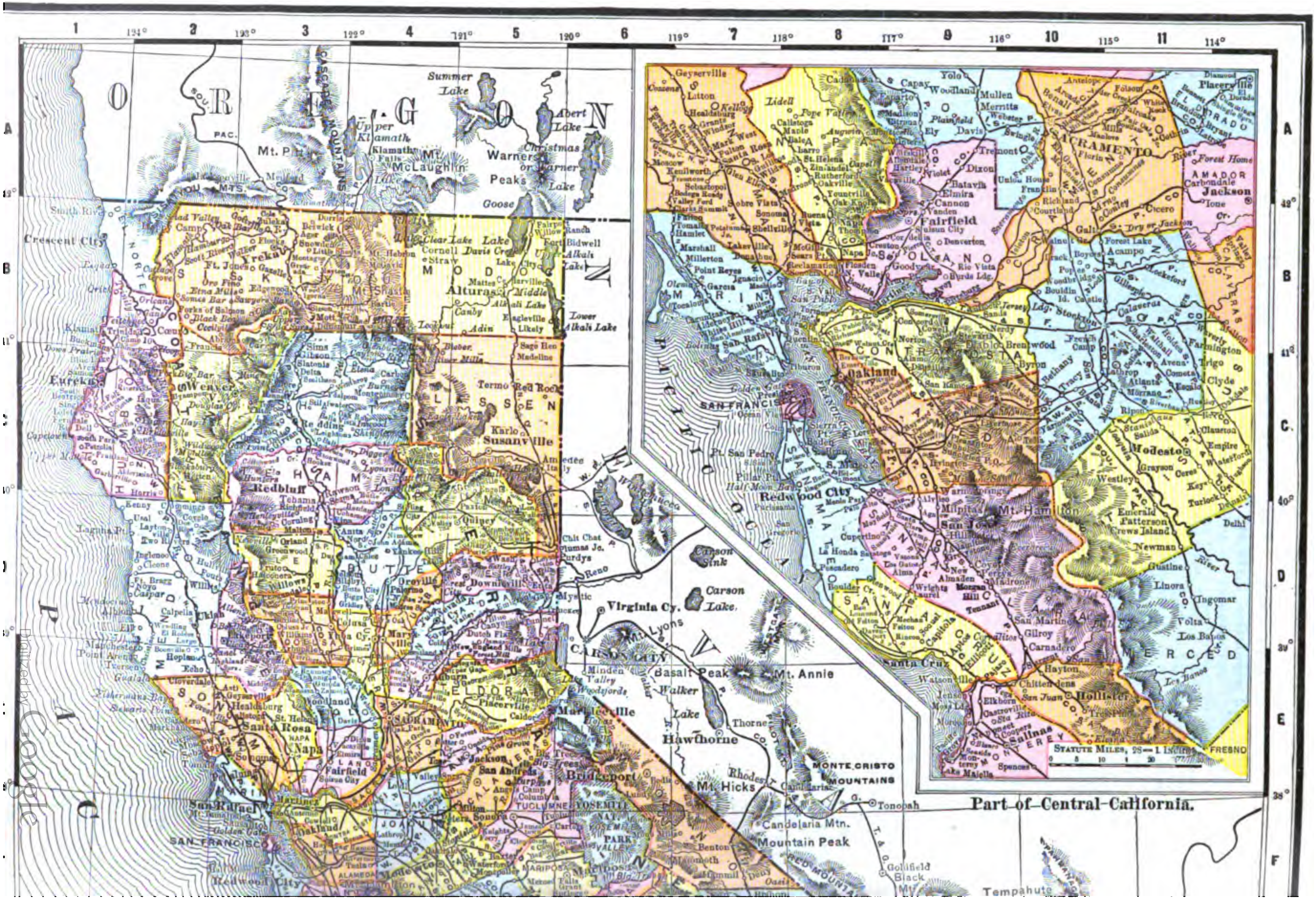
Pop.		
246,131	Alameda	F 4
309	Alpine	E 6
9,086	Amador	E 5
27,301	Butte	D 4
9,171	Calaveras	E 5
7,732	Colusa	D 3
31,674	Contra Costa	F 4
2,417	Del Norte	B 2
7,492	Eldorado	E 5
75,657	Fresno	G 6
7,172	Glenn	D 3
33,857	Humboldt	C 2
13,591	Imperial	J 10
6,974	Inyo	G 8
37,715	Kern	H 7
16,230	Kings	H 6
5,526	Lake	D 3
4,802	Lassen	C 5
504,131	Los Angeles	I 7
8,368	Madera	F 6
25,114	Marin	E 3
3,956	Mariposa	F 6
23,929	Mendocino	D 2
15,148	Merced	F 5
6,191	Modoc	B 5
2,042	Mono	F 7
24,146	Monterey	G 4
19,800	Napa	E 3
14,955	Nevada	D 5
34,436	Orange	J 8
18,237	Placer	E 4
5,259	Plumas	C 5
34,696	Riverside	J 9
67,806	Sacramento	E 5
8,041	San Benito	G 4
56,706	San Bernardino	H 9
61,665	San Diego	J 9
416,912	San Francisco	C 7
50,731	San Joaquin	F 4
19,383	San Luis Obispo	H 5
26,585	San Mateo	F 3
27,738	Santa Barbara	I 5
83,539	Santa Clara	F 4
26,140	Santa Cruz	F 3
18,920	Shasta	C 3
4,098	Sierra	D 5
18,801	Siskiyou	B 3
27,559	Solano	E 4
48,394	Sonoma	E 3
22,522	Stanislaus	F 5
6,328	Sutter	D 4
11,401	Tehama	C 3
3,301	Trinity	C 2
35,440	Tulare	G 7
9,979	Tuolumne	E 6
18,347	Ventura	I 6
13,926	Yolo	E 4
.....	Yosemite National Park	F 6
10,042	Yuba	D 4

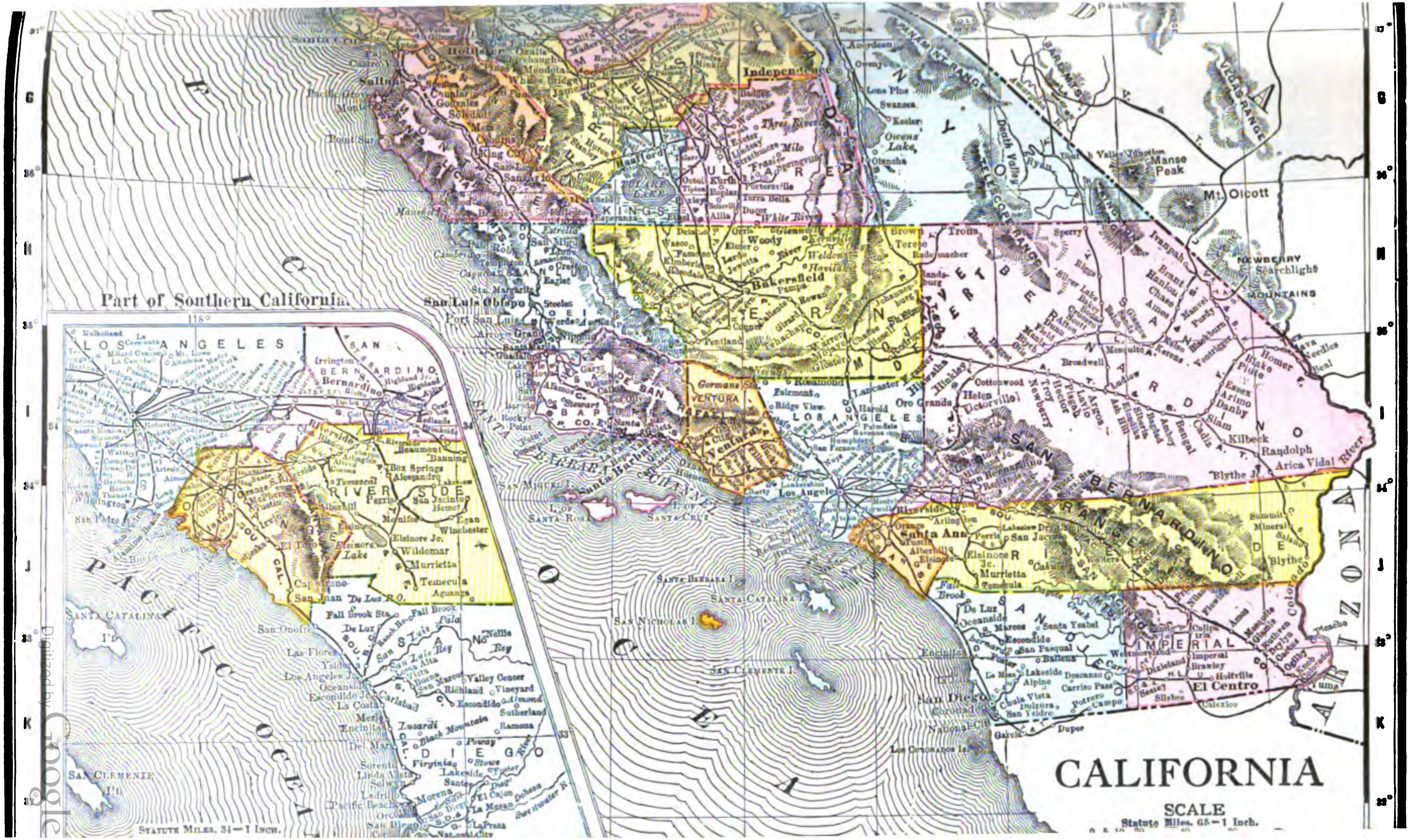
Incorporated Cities and Towns

27,732	Alameda	F 3
808	Albany, Alameda	F 4
5,021	Alhambra	I 7
916	Alturas	B 5
402	Alviso	D 9
2,628	Anaheim	J 8
1,124	Antioch	F 4
696	Arcadia, Los Angeles	I 7
1,121	Arcata	C 1
2,376	Auburn	E 4
1,477	Azusa	I 8
16,874	Bakersfield	I 8
481	Belvedere	F 3
2,360	Benicia	E 3
57,653	Berkeley	C 8
403	Biggs	D 4
1,190	Bishop	F 7
2,372	Black Diamond	F 4
507	Blue Lake	C 2
544	Boulder Creek	F 3
881	Brawley, Imperial	J 10
1,565	Burlingame	F 3
797	Calexico, Imperial	J 10
751	Calistoga	E 3
3,750	Chico	D 4
1,444	Chino	I 3
1,114	Claremont	I 8
823	Cloverdale	E 2
4,199	Coalinga	H 5
621	Colfax	D 5
3,980	Colton	J 8
1,582	Colusa	D 4
922	Compton	J 7
703	Concord	F 3
666	Coram, Shasta	C 3
972	Corning	D 3
3,540	Corona	J 8
1,477	Coronado	K 8
1,652	Covina	I 8
1,114	Crescent City	B 1
970	Dinuba	G 6
827	Dixon	E 4
214	Dorris, Siskiyou	B 3
1,719	Dunsmuir	B 3
1,661	East San Jose, Santa Clara	F 4
1,610	El Centro	K 10
488	Elsinore	J 8
2,613	Emeryville, Alameda	C 9
1,334	Escondido	J 8
518	Etna	B 2
14,684	Eureka	C 1
834	Fairfield	E 4
905	Ferndale	C 1
2,408	Fort Bragg	D 2
316	Fort Jones	B 3
883	Fortuna, Humboldt	C 2
675	Fowler, Fresno	G 6
34,958	Fresno	G 6
1,725	Fullerton	J 7
2,437	Gilroy	G 4
2,746	Glendale	I 7
4,520	Grass Valley	D 5
987	Gridley	D 4
4,829	Hanford	G 6
2,746	Hayward	C 10
2,011	Healdsburg	E 3
992	Hemet	J 9
279	Hercules, Contra Costa	F 4
679	Hermosa Beach, Los Angeles	I 7
2,308	Hollister	G 4
729	Holtville	K 10
160	Hornitos, Mariposa	F 6
815	Huntington Beach, Orange	J 8
1,299	Huntington Park	J 7
1,257	Imperial	K 10
1,536	Inglewood	J 7
2,035	Jackson	E 6
634	Kingsburg	G 3
870	Lakeport	D 3
594	Larkspur, Marin	E 6
1,000	Lemoore	G 4
1,402	Lincoln	E 7
1,814	Lindsay	G 4
2,030	Livermore	F 4
2,697	Lodi	E 5
1,482	Lompoc	I 5
44,865	Long Beach	J 7
954	Lordsburg	I 8
503,812	Los Angeles	I 7
745	Los Banos	G 5
2,232	Los Gatos	F 3
983	Loyalton, Sierra	D 5
2,404	Madera	G 5
2,115	Martinez	F 3
5,430	Marysville	D 4
1,041	Mayfield	F 3
3,102	Merced	F 5
2,551	Mill Valley	F 3
4,034	Modesto	F 4
3,576	Monrovia	I 8
274	Montague	B 3
4,923	Monterey	G 4
607	Morgan Hill	F 4
1,161	Mountain View	F 4
5,791	Napa	E 3
1,733	National City	K 8
2,689	Nevada City	D 5
892	Newman	F 4
445	Newport Beach	J 8
1,035	Oakdale	F 5
198,604	Oakland	F 3
3,119	Ocean Park	J 7
673	Oceanside	J 8
4,274	Ontario	I 8
2,920	Orange	J 8
836	Orland	D 3
3,859	Oroville	D 4
2,555	Oxnard	I 6
2,384	Pacific Grove	G 4
4,486	Palo Alto	F 3
46,450	Pasadena	I 7
1,441	Paso Robles	H 5
5,880	Petaluma	E 3
1,719	Piedmont	F 3
798	Pinole	F 3
1,914	Placerville	E 5
1,254	Pleasanton	F 4
497	Point Arena	E 2
13,150	Pomona	J 8
2,696	Porterville	G 7
576	Potter Valley, Mendocino	D 2
3,530	Red Bluff	C 3
3,572	Redding	C 3
14,000	Redlands	I 8
2,935	Redondo Beach	J 7
2,442	Redwood City	F 3
6,802	Richmond	F 3
884	Rio Vista	E 4
19,763	Riverside	J 8
1,026	Rocklin, Placer	E 4
2,608	Roseville	E 4
556	Ross	F 4
66,895	Sacramento	E 4
1,603	St. Helena	E 3
3,736	Salinas	G 4

INCORPORATED CITIES ETC.—Continued

Pop.		
1,531	San Anselmo	F 3
16,945	San Bernardino	I 8
53,330	San Diego	K 8
463,516	San Francisco	F 3
898	San Jacinto	J 9
38,902	San Jose	F 4
326	San Juan	G 4
3,471	San Leandro	F 3
5,157	San Luis Obispo	H 5
4,384	San Mateo	F 3
5,934	San Rafael	F 3
10,627	Santa Ana	J 8
14,846	Santa Barbara	I 6
4,348	Santa Clara	F 4
14,594	Santa Cruz	G 3
2,260	Santa Maria	I 5
7,847	Santa Monica	J 7
2,216	Santa Paula	I 6
7,817	Santa Rosa	E 3
2,383	Sausalito	F 3
2,143	Sawtelle	I 7
1,233	Sebastopol	E 3
1,750	Selma	G 6
1,303	Sierra Madre	I 7
636	Sisson	B 3
957	Sonoma	E 3
2,029	Sonora	F 5
4,649	South Pasadena	I 7
1,989	South San Francisco	F 3
35,358	Stockton	F 4
641	Suisun City	E 4
688	Susanville	C 5
385	Tehachapi	H 7
221	Tehama	C 3
2,758	Tulare	G 6
1,573	Turlock	F 5
2,136	Ukiah	D 2
2,384	Upland	I 8
1,177	Vacaville	E 3
13,461	Vallejo	A 9
2,945	Ventura	I 6
772	Vernon, Los Angeles	I 7
4,550	Visalia	G 6
4,446	Watsonville	G 4
1,922	Watts	J 7
481	Wheatland	E 4
4,550	Whittier	J 8
1,153	Willits	D 2
1,139	Willow	D 3
910	Winters	E 3
3,187	Woodland	E 4
1,134	Yreka	B 3
1.160	Yuba City	D 4


OREGON
NEVADA
PACIFIC
PACIFIC OCEAN
CASCADE MOUNTAINS
Mt. Pitt
Upper Klamath Lake
Klamath Falls
Mt. McLaughlin
Summer Lake
Abert Lake
Christmas Lake
Warner or Warner Lake
Warner Peaks
Goose Lake
Lower Alkali Lake
SISKIYOU MTS.
Smith River
Crescent City
DEL NORTE
SISKIYOU
Yreka
Mt. Shasta
MODOC
Alturas
Fort Bidwell
HUMBOLDT
Eureka
TRINITY
Weaverville
SHASTA
Redding
LASSEN
Susanville
TEHAMA
Redbluff
PLUMAS
Quincy
GLENN
Willows
BUTTE
Oroville
SIERRA
Downieville
MENDOCINO
Ukiah
COLUSA
YUBA
Marysville
NEVADA
PLACER
Auburn
Reno
Virginia Cy.
CARSON CITY
Carson Sink
Carson Lake
Mt. Lyons
Basalt Peak
Mt. Annie
Walker Lake
Hawthorne
Minden
Markleeville
EL DORADO
Placerville
SONOMA
Santa Rosa
NAPA
Napa
LAKE
SACRAMENTO
SOLANO
Fairfield
AMADOR
Jackson
CALAVERAS
San Andreas
TUOLUMNE
Sonora
YOSEMITE NAT. PARK
MARIPOSA
MONO
Bridgeport
MARIN
San Rafael
SAN FRANCISCO
Oakland
Redwood City
Mt. Hicks
MONTE CRISTO MOUNTAINS
Tonopah
Candelaria Mtn.
Mountain Peak
Goldfield
Tempahute
Part of Central California.
SACRAMENTO
Fairfield
SOLANO
CONTRA COSTA
ALAMEDA
SAN MATEO
SANTA CLARA
SANTA CRUZ
SAN BENITO
MONTEREY
SAN JOAQUIN
STANISLAUS
MERCED
Modesto
Stockton
San Jose
Mt. Hamilton
Santa Cruz
Salinas
Hollister
FRESNO
Statute Miles, 28 = 1 Inch
1
2
3
4
5
6
7
8
9
10
11
A
B
C
D
E
F
124°
123°
122°
121°
120°
119°
118°
117°
116°
115°
114°
42°
41°
40°
39°
38°


CALIFORNIA
SCALE
Statute Miles. 65 = 1 Inch.
Part of Southern California
STATUTE MILES. 34 = 1 INCH.
PACIFIC OCEAN
ARIZONA
SAN BERNARDINO
RIVERSIDE
SAN DIEGO
IMPERIAL
LOS ANGELES
KERN
TULARE
KINGS
INYO
VENTURA
SANTA BARBARA
SAN LUIS OBISPO
ORANGE
MONTEREY
Bakersfield
San Luis Obispo
Santa Barbara
Los Angeles
Santa Ana
San Diego
El Centro
Independence
Death Valley
TELESCOPE RANGE
VEGAS RANGE
PANAMINT RANGE
NEWBERRY MOUNTAINS
Mt. Olcott
Manse Peak
Owens Lake
Tulare Lake
SANTA CATALINA I.
SAN CLEMENTE I.
SAN NICOLAS I.
SANTA BARBARA I.
SANTA CRUZ
SANTA ROSA
SAN MIGUEL I.
Point Sur
Salinas
Blythe
Needles
Colorado River
G
H
I
J
K
37°
36°
35°
34°
33°
32°
118°

equalizer; its contact on the east with the «Great American Desert»; its huge mountain systems; and its orographic protection against the north, are all vital factors in determining its atmospheric temperament. While the Atlantic seaboard is made humid by the warm Gulf Stream, and is open to the north (its mountains being scattered, low and well inland), California is screened from the Arctic air-currents by a vast Alpine range, almost unbroken in its whole length and with its lowest passes 50 per cent higher than the highest peak east of Colorado. The State has 120 peaks exceeding 8,000 feet, 41 exceeding 10,000 feet and 11 exceeding 13,000 feet. From its northern boundary down to Point Conception, California is washed by the cold Kuro Siwo, or Japan current, swinging back from the Arctic; and the exposure is largely westerly. From this point southward the exposure is more southerly, the Japan current is deflected far off-shore, and the coast is sheltered by a long line of islands. Tempered on one side by an equable ocean, on the other by 1,000 miles of arid lands, the climate of California is still further differentiated by its mountain systems. Roughly speaking, it is all «under wall.» Two huge cordilleras, inosculating at the north and south, form an almost complete circumvallation of the great agricultural region; while to the south, though the ranges are much broken down, there is something like a repetition of this pattern, on a much smaller scale; the whole forming something like an inverted figure 8. In their major loop, these ranges enclose one great central valley, practically level, of 18,000 square miles,— or about the aggregate area of Massachusetts, New Jersey and Delaware,— screening it from the Arctic, and filtering the winds from sea and desert. This great rampart is broken down only at the Golden Gate, through which, in a mile-wide passage, the drainage of this enormous watershed reaches the sea. In their imperfect minor loop, there is a broken congeries of valleys aggregating an almost equal area, sheltered from the desert, but as a rule open southerly toward the here warmer sea. To the east of the main wall lies a large but almost uninhabited area, strictly desert, and part of the great interior wastes. The inclination of the State to the west, and its consequent southern exposure, is indicated by the fact that despite its narrowness the extremes are three-fourths as far apart in longitude as in latitude. The southeast corner or San Bernardino County is nearly 500 miles more easterly than False Cape; while from Oregon to the Mexican line the north and south distance is about 655 miles.

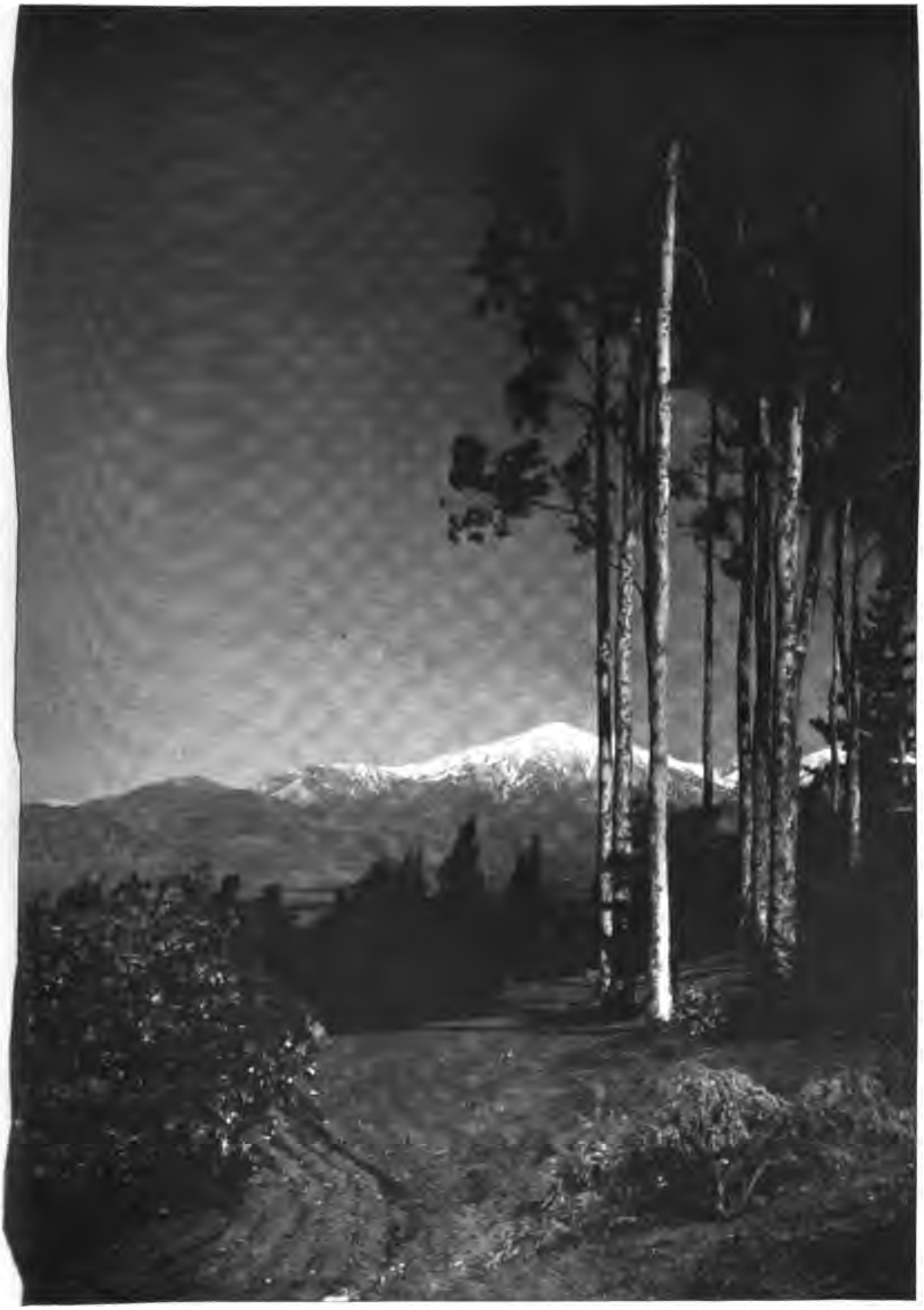
The Coast Range, altitude 2,000 to 8,000 feet, rather closely follows the coast line from Oregon to Point Conception; south of which topographic hinge it so breaks down as to be relatively unimportant. The Sierra Nevada proximately following the east line of the State, at an average distance of 50 to 100 miles therefrom, is «the largest and most interesting chain of mountains in the United States» (J. D. Whitney). Really part of the gigantic spine which extends from Lower California to Alaska, this range in California is 600 miles long and 75 to 100 miles wide — its base covering four times the area of Massachusetts. The snow-line averages about 30 miles wide. Its surpassing peak (Mount Whitney, highest in the United States) is 14,522 feet (Langley). Its passes average 11,000 feet, the lowest being 9,000 feet, and the most used (Kearsarge) 12,000 feet. The western slope is gradual, averaging about 100 feet to the mile; its eastern slope 10 times as rapid, being by far the steepest general gradient in North America. At many points the fall is 10,000 feet in 10 miles; and from the highest peak in the United States one looks down nearly 15,000 feet into Death Valley, some 200 feet below sea-level. This vast granitic range is the most remarkable register of glacial action on the continent. Decapitated by «perhaps a vertical mile» (Muir) it is still the most Alpine cordillera in North America. It holds 1,500 glacial lakes — the lake line being at about 8,000 feet. Of small residual glaciers, Muir has counted 65 between 36° 30" and 39°. Its Yosemites (including the famous one so-called, the Hetch-Hetchy, and minor ones) are noted among geologists as well as travelers — well-like valleys gouged deep in the granite by glaciers, and of scenery nowhere surpassed. The highest water-fall in the world (the Pioneer, 3,270 feet) is in this region. Upon the huge moraines left by that continental incubus of ice grow the noblest coniferous forests in the world — greatest in variety of species, in density of merchantable lumber and in size, age and beauty of trees. These forests cover 44,700 square miles (a larger area than the entire States of New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, Delaware and Maryland together). California is fifth in area of forests and second in stand of lumber (200,000,000,000 feet, exceeded only by Oregon with 225,000,000,000 feet). Eighteen national forests reserves in the State cover 19,508,000 acres. The cut of 1916 was nearly three times that of 1890. It comprised: redwood, 490,828,000 feet; Western (white) pine, 494,973,000 feet; Douglas fir, 141,200,000 feet; sugar pine, 165,461,000 feet; white fir, 85,918,000 feet; spruce, 10,000,000 feet; cedar, 16,587,000 feet; hemlock, 500,000; other trees, 25,000,000 (1,430,467,000); shingles, ties, etc., 130,000,000 feet; a total of 1,560,467,000 feet. To this should be added 30,000 cords of tan-oak bark, valued at $600,000. Total value of product, 1916 (exclusive of fuel) $47,000,000. Fuel wood amounts to about $9,000,000. The Big Tree (*Sequoia Gigantea*) is the largest and oldest of growing things on earth; averaging 275 feet high and 20 feet diameter. The largest reach over 325 feet high and 38 feet diameter, with an age of 5,000 years. Muir «never saw a Big Tree that had died a natural death.» The other Sequoia (*Sempervirens*), or California redwood, covers an area of about 2,000 square miles. It is second only to the Big Tree in size, reaching 18 feet diameter; and like it is found nowhere else. It belongs to the Coast Range, as the Big Tree to the Sierra. It is almost exclusively used in California for sheathing. The immunity of a city like San Francisco from great fires, though windy, hill-built, and of «frame,» is largely due to the low inflammability of this redwood lumber. The sugar pine, the noblest pine yet discovered, reaches 245 feet high and 18 feet diameter; the yellow pine 220 feet high and 8 feet diameter; the Douglas spruce, king of spruces, 200 feet high, 6 feet diameter; the Libocedrus, or incense cedar, 150 feet high and 7 feet diameter; the white silver fir 200 feet high, 6 feet diameter; the «magnificent» silver fir 250 feet high and 5 feet diameter. The nut pine, or piñon, is a small and shabby tree, but of great economic importance in feeding the Indians and horses; in a good year its crop of excellent nuts is enormous — estimated (Muir) equivalent to 50,000 acres of wheat in food value. These are often fed to horses instead of barley. There are many varieties of oaks (which reach great size); also maples, yews, birches, alders, sycamores, cottonwoods, aspens, madroños, etc. A California palm (*Washingtonia*) is native in mountain cañons along the southerly desert, and is now largely used for street ornamentation. Specimens planted by the Franciscans have reached a height of 80 feet. The flora of the State includes about 2,500 species, and is of great interest. In the great central valley in February or March one can travel 400 miles, treading flowers at every step; and as much is true in other parts of the State.

No other State contains a moiety of the vast number of exotic trees now in California. Fruit, ornamental and shade trees from every country in the world have been acclimated here. Nearly 11,000,000 tropical fruit trees are bearing in 1918. Millions of «pepper-trees» (*Molle*) from Peru are used on streets, etc.; and of Australian eucalyptus (introd. 1858), there are now over 15,000,000, including about 100 varieties, for fuel and ornament. Setting 3,000,000 acres to orchard and other trees within a generation has partially balanced the deforestation, though not where needed to offset the denudation of the watershed by lumbering and forest fires.

The most striking meteorological feature of California is perhaps the ordering of its seasons, of which it has practically but two, the wet and dry. The winter, or «rainy season,» is approximately from late October to late April, with 15 to 25 rainy days, an annual precipitation ranging from 23.53 inches for San Francisco (and far greater in the extreme north) to 14.56 inches for Los Angeles, and 10 for San Diego. For six months after 1 May, rain is practically unknown, except showers in the high mountain regions. In 1917–18 there were 361 days with only ½ inch of rain in Los Angeles, the largest city west of Saint Louis. In the high Sierra the winter precipitation takes the form of snow, with an annual fall of 30 to 50 feet, thus supplying the natural reservoirs which feed the streams, upon irrigation from which agriculture largely depends. But in Oregon, which bounds California on the north, we have the familiar eastern seasons; and again in Arizona and Nevada, abutting upon the east, winter snow and summer rains characterize the meteorology. Thus, climatically, California differs altogether from all its neighbors and has well been called an «Island on Land.» Within its own limits, also, it has extraordinary range of climates, as it were in strata, following the topographic contours. Thus in the vicinity of Los Angeles it is possible at times to take a sleigh-ride within 12 miles of the city on one side (and looking down upon blossoming orange groves not five miles distant), and by an hour's ride to bathe in the Pacific, which has here a winter temperature of 60°. Within a short journey from almost any given point one may find almost any variety of climate, from below sea-level to nearly 15,000 feet above it; from the extreme but arid and non-prostrating heat of the desert to eternal snow; from palms and perennial roses to the primæval coniferous forests, or to the desolation of alkaline Saharas. Although all California shares the seasonal peculiarity of «California climate,» the northern and southern parts of the State — roughly dividing at Point Concepcion and the Tehachepi Range — are very unlike meteorologically. The upper portion is relatively humid, with more than twice the south's average rainfall, with far larger streams and vastly richer forestation. At Crescent City, on the far coast, precipitation often reaches 80 inches per year. The trend of the coast is here northerly, and the region shares something of the extraordinary humidity of Oregon. The smallest precipitation is in the desert southeast corner, averaging only three inches annually at Yuma. The seven counties habitually termed «Southern California» — though the geographic southern half of the State would include 13 counties — have an average rainfall of but about 15 inches. This precipitation is insufficient to ensure crops, except cereals (which are not irrigated but depend on the rains). This broad difference between the two sections in rainfall has been chief factor in an extraordinary difference of development within the last 30 years. Compelled by aridity to resort to irrigation, compelled by the magnitude of the task to associative effort, the southern communities have suddenly developed a generic type of agriculture and of life quite unlike anything else in the Union. The paragraph on population shows something of the disproportionate settling-up of the southern end of the State — an entire reversal of the balance which obtained for nearly 60 years, during which the population was overwhelmingly about «the Bay» and San Francisco was practically California, socially, politically and financially.

About San Francisco there is a steady and brisk wind movement, flowing in through the narrow gap of the Golden Gate. In southern California, while there is daily ebb and flow of air-currents (in the morning from off the sea, and at night down from the mountains), a real wind is very rare. Hurricanes and cyclones are absolutely unknown in the State. Despite the great heat of the deserts, and high mercury sometimes recorded in the valleys, the dryness of the atmosphere renders it harmless, and sunstroke is unknown. Seasonal diseases, typhoids, malarias and pernicious fevers, summer diseases of children, gastric or hepatic diseases, are rare. Mean summer temperature San Francisco 60°; winter mean 51°; greatest daily range temperature Los Angeles 29°, as against 69° for Boston. The modern migration to California has been largely attracted by this unique and hospitable climate, free from the dangerous heats of summer and the bitter winter cold of the regions east of the Rocky Mountains. In the inhabited portions of this State, extreme cold is unknown; while, owing to rapid radiation, the summer nights are always so cool as to call for blankets.

The fauna of California is peculiarly interesting, and includes considerably over 100 species of mammals, though the larger game varieties have in a half century been nearly



"Ten Miles" Range including Mount San Bernardino, altitude 11,800 feet; full-bearing orange groves to the left; 100-foot Australian Eucalyptus to the right

exterminated. At the American occupation, elk were seen in droves of thousands. Great numbers were killed from the deck of steamers plying to Sacramento. Occupation of the State by Indians immemorially, and by Spaniards for nearly a century, had not appreciably diminished the wild animals; but the same wanton spirit which in a score of years exterminated tens of millions of the American bison on the great plains has in California made the great mammals nearly extinct. The grizzly bear (the State emblem) once in great abundance in all parts of the State is now scarce; the black, cinnamon and brown bear are more common, though rare. Sea lions of a ton weight are still found along the coast, and their populous rookeries a few hundred feet from the «Cliff House» in San Francisco are an object of interest to travelers. The California lion, mountain lion or puma, is still not infrequent, and wildcats abound in the mountains. The coyote is common and of utility in decimating the hordes of rabbits, though an ill-judged bounty on coyote scalps has of late years much reduced the numbers of this small wolf. The beaver, once in vast numbers here, is now confined to the remotest streams; and the valuable sea otter is almost extinct. Black-tailed and mule deer are still reasonably frequent; but the antelopes, which once roamed the northern and southern valleys in great bands, have hardly a representative left. The same is true of the mountain sheep (*Ovis Ammon*), once common in all the higher ranges. Spermophiles, or ground squirrels, and five species of gopher, are innumerable and a great pest to the farmer as well as carriers of bubonic and other diseases. The Federal and State governments are making scientific campaigns to exterminate them. Millions have been poisoned. The true gray squirrel is common in the north. Jack rabbits and «cotton-tails» are abundant in all parts of the State, despite community «drives» in which sometimes tens of thousands are killed in a day. The birds of California number above 350 species. The largest winged creature in North America is the California condor. Quail of two species are in vast abundance throughout the State.

Earthquakes.— While the Pacific Coast of North, Central and South America in general is peculiarly liable in recent geological times to seismic disturbances, California has never experienced an earthquake of the second magnitude, nor probably even of the fourth. The only first-degree earthquake in the United States was that of New Madrid, Mo., in 1811. The largest city in the world, if built upon its epicentre would have been irremediably wiped off the map. California has never had an earthquake approaching in severity that of Charleston, S. C., in 1886. The most serious «tremblores» of California were in 1812 when the fall of the Mission tower of San Juan Capistrano killed 30 persons in the church, but did no special damage elsewhere in the village; and 1872 when some old adobe houses in Owens Valley collapsed and killed 19 Mexicans. The «Earthquake» of San Francisco, April 1906, was a very minor shock (geologically) — not above the 6th or 7th magnitude. It broke rusty water-mains in the 30 feet of sand with which lower San Francisco is «filled». It threw down a few decrepit frame buildings, on the same sand «fill,» but not a single respectable structure in the city. Fire caught in one of the wrecked tenements; and half San Francisco was consumed because there was no water to check the fire. In Charleston, practically every building was wrecked by the earthquake.

The unremitting tension upon the crust of the entire earth has found its «safety-valves» in California. The earthquake «faults» are not only known and visible, but mapped. There is no excuse for building towns or reservoirs across one of these «faults.» For this reason, the foremost geologists agree (vid. Branner) that California is safer from earthquakes than are many States where these safety-valves have not yet been developed, and earthquakes are as yet strangers.

River Systems.— As in most arid States, the drainage of California is simple. For some 300 miles on its southeastern edge the State is bounded by the Colorado River, which rises in the Rocky Mountains in Colorado and flows 1,360 miles to the Gulf of California. It has no tributaries whatever from California, all eastbound streams from the Sierra Nevada being lost in the desert. On the western coast, though a few rivers reach the sea (like the Klamath, Mad, Eel and Salinas) they are relatively unimportant and incidental. The real drainage system of the State has outlet through San Francisco Bay and the Golden Gate, by two chief inland rivers which join about 60 miles northeast of San Francisco. Both rise in the Sierra Nevada, the Sacramento (370 miles long) to the north, the San Joaquin (350 miles long) to the south. Their main course averages along nearly the median line, north and south, through nearly two-thirds the length of the State. They have no tributaries worthy of the name from the great westerly mountain wall, the Coast Range; their waters being fed almost exclusively from the vast Alpine chain which is in effect, though not politically, the eastern boundary of California down to latitude 35° 30″. Their important feeders from the Sierra are the Feather, Yuba, Cosumnes, American, Mokelumne, Kern, Kings, etc. All these are fine mountain torrents, beloved of sportsmen, and flowing through magnificent scenery, but not of rank as waterways. The most important is the Feather, which has a large drainage area. Several streams in southern California, like the Los Angeles, San Gabriel and Santa Ana, reach the sea, but all are practically exhausted by irrigation uses, except during winter flood-water. The many streams from the abrupt eastern slopes of the Sierra Nevada all disappear in alkaline «sinks,» — like Pyramid Lake, the Mojave River, Mono Lake and Death Valley,— and never even in flood reach the ocean by their great natural conduit, the Colorado River.

The total mean annual run-off (in acre-feet) of 32 chief California rivers is 59,078,200. The Colorado River is enormously largest, with 16,900,000 acre-feet; the Sacramento next with 9,770,000; the Feather 5,880,000; American 3,820,000; Yuba 3,050,000. The San Joaquin, Kings, McCloud, Merced, Stanislaus and Link rivers all exceed 1,000,000 acre-feet; and the Tuolumne 2,000,000. Seven others exceed 500,000.

The Sacramento and Colorado are navigable to light-draft steamers to the State capital and to Needles, respectively. The lakes of California are not important as to navigation. Tulare Lake, receiving the drainage of the Kern, Kaweah and Kings rivers, is 700 square miles in area, but only 40 feet deep. In very high water its overflow reaches the San Joaquin; but ordinarily its income of waters is cared for by evaporation. Lake Tahoe in the extreme north, at an elevation of 6,200 feet, is 20 miles long and 1,500 feet deep, and famous for the purity of its waters, the beauty of its scenery and its trout. It is the largest of the glacial lakes, of which there are a great number in the Sierra, mostly at altitudes exceeding the highest mountain summits east of Colorado. The lower-lying lakes of the State are mostly without outlet, and of various degrees of brackishness, culminating in the "sink" of the Amargosa River nearly 200 feet below sea-level on the eastern side of the range, where evaporation has left vast alkaline deposits, now of great commercial value.

Geology.— The main axis of the Sierra Nevada is of granite throughout. To the north there are some metamorphic peaks, and many summits are capped with volcanic materials. Mount Shasta in the far north is an extinct volcano (14,470 feet). So also is Lassen's Peak (10,577 feet), of late years sometimes emitting smoke. This granite core is flanked by a very heavy mass of slaty, metamorphic rocks,— mostly argillaceous, chloritic and talcose slates, — constituting the great auriferous belt of the Sierra. The Coast Range is made up almost entirely of cretaceous and tertiary marines, chiefly sandstones and bituminous shales. It is in this belt that the recent vast development of petroleum has been made.

Besides the vast reaches of alluvial soils in the lower valleys, which were first selected for agriculture, an enormous area of disintegrated granite gravels along the foothills and first acclivities has been found the most productive soil in the State, particularly with reference to valuable crops. These great gravel beds, which seem to the farmer from the black "bottoms" of Ohio the most unpromising of soils, are in reality rich in all the elements of plant food. The vast majority of the valuable orchards, particularly of southern California, are planted upon this granitic detritus; and without exception the finest oranges and other citrus fruits come from this soil. The relative aridity of California, long supposed to be a curse, is now known to be a two-fold blessing. Exhaustive analyses, comparative with every portion of the Union, show these gravels to average much richer in chemical constituents than soils leached out by excessive rainfall. Furthermore, the fact that precipitation is not invariably sufficient to ensure crops has compelled irrigation, which does ensure them; so that farmers in the arid lands have much greater crop-certainty than those of regions with most abundant rainfall.

Agriculture.— In no item of its history has California been more unlike other States than in development and sequences of agriculture. The first (and for 60 years commercially chief) industry was cattle — derived from herds introduced from Mexico by Viceroy Galvez, 1769, and chief wealth of the Mission establishments and Spanish colonists. It was a generation after the American occupation before agriculture was seriously undertaken; and for another term of years it was chiefly a gigantic seasonal "gamble with the weather" in dry-farming of cereals. The characteristic features of agriculture up to about 1870 were enormous holdings,— reckoned by at least tens of thousands of acres,— with the single crop (almost exclusively wheat and barley) and purchase of every other article of necessity or luxury. On areas of hundreds of square miles apiece there were an individual or corporate owner, a single crop, a few hundred hirelings at the height of the season and their temporary quarters. A few of these enormous ranchos still survive; and Miller and Lux still farm about 1,000,000 acres, with 20,000 acres in a single field. But within a generation the typical character of agriculture in California has radically changed. The greatest record drought (1864) which not only destroyed grain but hundreds of thousands of cattle (60,000 head being sold that year in Santa Barbara at 37½c. per head), exclusion of the Chinese, who had been the chief reliance for labor on the great ranchos, the fall in wheat, and other factors, led to the breaking up of these gigantic domains. A slight idea of the change may be had from the census fact that in 1850 the average size of all California farms was 4,456.6 acres; and in 1910, 318 acres. Along with this great dry-farm gambling — for such it was — sheep became a leading industry in the State, particularly in southern California. But the enormous increase in value of land has reduced sheep to a valuation of $17,000,000. The city of Pasadena (Pop. 40,000) was a sheep pasture in 1870.

Within about 30 years — that is, since 1885, — the general character of California farming has changed to small holdings, occupied not by tenants but by American owners, with families, with diversified crops, and obliged to purchase only the luxuries of life; with intensive methods and certainty (by irrigation) of crops. California has now more than one-fourth of all the irrigators in the United States. The average size of irrigated farms is in southern California 21¼ acres; in rest of State about 82 acres. The typical California farm under the modern régime is perhaps 10 acres; irrigated either by its own pumping plant or from a community ditch, and yielding an annual income of not less than $200 per acre and sometimes $900.

Perhaps the greatest single factor in bringing about this structural change was the orange. In 1862 there were 25,000 orange trees in the State, all seedlings, and deriving from Mexico, where the fruit was introduced by the Spaniards nearly three and a half centuries earlier. In 1873 two seedless orange trees from Brazil were sent from the Department of Agriculture in Washington to Riverside, Cal. From these two parent trees has sprung the modern orange industry of California — and practically of the United States; as Florida, the only other orange State in the Union, yields only one box of oranges to California's two. Millions of trees grafted from their "buds" are now bearing in this State, and the hereditary fruit, seedless and delicious, leads the American market. This crop, highly remunerative, and practically continuous (shipments being made every month in the year) has been for these

SOUTHERN CALIFORNIA PALMS

CALIFORNIA ROSE GARDEN

CALIFORNIA

1 Mt. Shasta, from Sisson's

2 Mt. Tamalpais, near San Francisco

reasons, and æsthetic ones, a large attraction to high-class immigration, and an important factor in shaping agricultural methods. For development of the industry, see statistics below.

In deciduous fruits, total production, shipments fresh, canned and dried, California has within a generation come to lead the Union; as it leads in all tropical fruits.

Beet Sugar.—California was the first successful grower of sugar beets, and has by far the largest factories. In 1909 it was second to Colorado in the value of its beet-sugar output ($11,981,000), or 25 per cent of the total. The beet sugar industry of the United States originated at Alvarado, Alvarado County, Cal. In 1916 the output of its 11 beet-sugar factories was 472,770,100 pounds of sugar; value, $30,800,000. In 1917 the number of beet-sugar factories and acreage planted to beets had increased in one year over 26 per cent. California beets average 7 per cent higher in sugar than those of other States. The effect of the great war and government control on agriculture in California (as elsewhere) is not yet to be prophesied; particularly as to beet sugar, wheat, beans and live-stock. In 1917 the production of sugar beets was 2,636,800,000 pounds. Within a decade California has become the greatest producer of beans (navy and frijol, but principally lima). In 1916 the yield of beans was 5,047,082 bushels, valued at $19,144,000. In 1917 there were 8,035,000 bushels at double the value per bushel. This industry is practically confined to Ventura, Los Angeles, Orange and San Diego counties. Within less than a decade, also, cotton has come to count in the agricultural resources of California. Imperial County, organized 1907 (a recently reclaimed desert, often compared with the valley of the Nile), now produces annually 65,000 bales of cotton (40 per cent Durango or long-staple) worth $9,380,000, besides a great variety of other vegetable products. It lies along the Colorado River, just north of the Mexican line. Ten years ago a desert, it has now a population of 50,000, with several small cities and tens of thousands of acres under cultivation by a huge irrigating system from the river.

With modern refrigerator freight cars, a vast quantity not only of citrus and deciduous fruits, but even of fresh vegetables, is now shipped from California, 2,000 to 3,000 miles to the Eastern States, including some 800 carloads of celery annually from one small town. Strawberries are in the Los Angeles market every month of the year, but are shipped (as are blackberries, raspberries, loganberries, etc.) to Arizona and New Mexico only in summer; as are also the famous canteloupes and watermelons. California is foremost producer of the most extraordinary of forage plants, the Arabian-Spanish-Mexican alfalfa. This produces, under irrigation, about one ton per acre for each of four to eight cuttings per annum. In 1917 it sold at $26 per ton. In 1910 there were 487,134 acres planted to alfalfa; in 1916, 862,534 acres.

GRAIN	Acres	Yield, bushels
Corn	75,000	2,400,000
Wheat	375,000	7,425,000
Barley	1,350,000	39,150,000
Oats	196,000	6,860,000
Rye	8,000	104,000
Rice	80,000	5,600,000

CALIFORNIA FIELD CROPS, 1916

CROP	Acres	Yield	Value
Hay and forage	2,533,347	4,327,130 tons	$55,125,000
Grain	1,812,000	47,572,000 bush.	47,507,000
Potatoes	200,000	10,575,000 bush.	4,230,000
Onions	....	2,350,000 bush.	2,400,000
Dry beans	558,000	6,100,000 bush.	20,000,000
Celery	3,500	2,600 cars	1,000,000
Beet sugar	144,200	472,770,100 lbs.	30,800,000
Rice	80,000	5,600,000 lbs.	9,800,000
Cotton	117,000	65,000 bales	2,574,000
Wool	....	11,600,000 lbs.	2,552,000
Hops	19,991	21,552,500 lbs.	4,869,000
Sweet potatoes	6,000	960,000 bush.	768,000

Up to 1808 the hop industry of the United States was all in Maine, Vermont and Massachusetts. Soon New York, with better soil, had a monopoly; then Wisconsin and Michigan became important hop-growers. In 1916 five counties of California produced more hops than all the rest of the United States. In 1916 the live-stock in the State consisted of 468,000 horses, valued at $45,396,000; 70,000 mules, valued at $8,120,000; 591,000 milch cows, valued at $39,597,000; 1,636,000 other cattle, valued at $62,332,000; 2,524,000 sheep, valued at $16,911,000; 994,000 hogs, valued at $10,039,000; and poultry valued at $19,000,000, making a total value of $201,395,000.

In the same year the total value of the State's dairy products amounted to $40,310,105, consisting of 70,030,174 pounds of butter, worth $19,181,264; 7,745,124 pounds of cheese, worth $1,203,592; and other produce valued at $19,925,249.

The sensational achievements of Luther Burbank in hybridizing fruits — for instance, the creation of a large plum without any pit whatever — are already world-famous. Almost as remarkable results have been reached in floriculture. Seeds and bulbs are raised on a great scale; carnations, calla lilies and other flowers being grown outdoors by the 10-acre field. A large proportion of the flower seed of the United States is grown in California, and it supplies most of the mustard of the nation. The total area of California farms is now over 46,000 square miles, considerably exceeding the entire area of States of Massachusetts, New Hampshire, Vermont, Connecticut, Rhode Island and Maryland. The State was eleventh in the Union in per capita value of farm products ($88) and fifth in value of products of farm ($1,816 as compared with Ohio, $929) in 1900. California had in 1910, 87,670 farms; total value of farm property, $1,448,560,000; total value of farm products 1899, $131,690,606. Total acreage in farms, 27,883,000 acres, of which 11,380,000 acres are improved. The area farmed decreased 3 per cent, 1900 to 1910. In 1850 there were 872 farms; in 1860, 18,716; in 1870, 23,724. The development of farming is briefly indicated as follows to 1910 — the latest Federal figures available. The great increase since 1910 cannot be officially stated.

YEAR	Farms	Acres	Value farm property	Value products
1910	87,670	27,883,000	$1,448,560,000	....
1900	72,542	28,828,951	796,527,955	$131,690,606
1890	52,894	21,427,293	772,065,570	87,033,290
1880	35,934	16,593,742	305,999,443	59,721,425

The largest number of farms was in Los Angeles County (6,577); three other counties had over 3,000 farms each; Santa Clara, 3,995; Sonoma, 3,676; and Fresno, 3,290. Of all farms, 84,692 were farmed by whites; the rest by Indians, Chinese, negroes, Japanese.

Dairy cows had increased nearly one hundred-fold since 1850, in 1910 being 464,000. Horses (1910), 462,000; mules, 68,000; sheep, 2,325,000; swine, 749,000; of other cattle there were 1,155,000. Total value of domestic animals 1910, $119,487,452 — including poultry and bees, $4,566,629; animals sold and slaughtered, $15,754,985; poultry and eggs, $6,356,746; wool, $1,707,088. Sheep and wool decreased steadily, from 1879, with the great increase in value of lands for farming.

From 1850 to 1900 the population increased sixteen-fold; number of farms over eighty-fold. California was one of the few States in 1900 that in 30 years added more to its agricultural than to its other population.

Irrigation and Horticulture.— Development of the new and characteristic agricultural era in California is outlined by these statistics from the last available census (1910).

	No. irrigators	Acres irrigated	Value irrigated crop
United States....	102,819	7,263,273	$84,433,438
California.......	25,611	1,445,872	32,975,361

Of the 72,542 farms in the State, 25,675 or 35.4 per cent were irrigated, an increase of 44 per cent in 10 years; the number of irrigators increased in the same term 87 per cent, showing the great subdivision of the lands — nearly twice as many people living on the same area. Total cost of construction of all irrigating systems, $19,181,610; so the irrigated crop of 1899 alone paid nearly $14,000,000 in excess of total cost of works. Los Angeles County led by far in number of irrigators (4,066); only Fresno (2,459) having one-half as many. In number of acres Fresno County was far in the lead, with 283,737 acres; Kern next with 112,533 and Merced, 111,330. Of the total 1,445,872 acres irrigated in 1910 (last available figures), 1,293,608 were irrigated from streams. There were 2,361 artesian wells and 10,924 pumped. By 1914, the pumping-plants for irrigation had increased to 24,589. More than half the flowing artesian wells in the United States were in California; and a large number of farms were served by electric power pumped from underground wells.

Of deciduous orchard trees there were in the State, in 1916: Apples, 61,752 acres; apricots, 96,716 acres; cherries, 13,484 acres; figs, 10,872 acres; peaches, 107,971 acres; pears, 40,324 acres; plums, 22,805 acres; others, 19,000 acres; a total of 372,924 acres planted to deciduous orchard trees. In 1916 the shipments of fresh deciduous fruit from 50 counties of northern California were 17,890 carloads; from the seven counties of southern California 450 carloads, having a total value of $29,500,000.

In 1916 the citrus fruits (orange, lemon and grape-fruit, nearly all from southern California), were 192,607 acres; shipments reached a total of 45,083 carloads, valued at $41,348,000.

Dates were recently introduced from the government experimental stations in Arizona. In 1916 the Coachella Valley produced $65,000 of dates. The acreage has vastly increased since. There are over 7,000 bee-keepers in the State, owning more than 600,000 colonies. The production of honey in 1916 was 11,100,000 pounds, valued at $642,000.

California was first (1769), and is still practically the only State to produce the olive and its oil. Thirty-eight counties now grow the olive, though only in half a dozen is it important. There are about a million bearing trees in the State, and half as many not yet bearing. The California «ripe» olive has become of great commercial importance; while the «dehydrated» seems destined to become even more popular. The annual production of oil (1916) is 1,000,000 gallons; packed olives, 18,000,000 gallons.

Of dried fruits the output is larger than in any other State.

Dried Fruit	1913 tons	1916 tons
Apples................................	1,900	4,500
Apricots..............................	10,500	10,900
Figs..................................	5,000	6,700
Peaches...............................	23,000	28,000
Prunes................................	48,000	68,500
Raisins...............................	65,000	115,500
Sundry................................	2,000	3,000
Total..........................	155,400	237,100

Almonds and walnuts are not «commercially» produced elsewhere in the United States. Both crops have more than quadrupled in a decade. In 1916 the yield was, for California, 3,400 tons of almonds and 12,800 tons of walnuts.

California produces 95 per cent of the United States almond crop; and over four times the nation's importation of this nut. The aguacate, avocado or alligator pear (from Guatemala) is of recent introduction, but there are already over 35,000 trees in southern California; and the ordinary income is $200 per tree — the fruits selling as rarities at 50 cents to $1.25 each. In the last census year the number of plum and prune trees was greater than the total number of all deciduous orchard trees 10 years before. The number of apricot trees had more than doubled in the decade.

Total number of semi-tropical fruit trees had increased from 1,809,161 to 8,996,459 in the decade. Of the latter number 62.8 per cent were orange trees; 17 per cent olives; 16.6 per cent lemons; 2.1 per cent figs. Other trees included were guavas, kaki, limes, pineapples, pomelos, etc. The counties of San Bernardino, Los Angeles, Riverside and Orange contained more than four-fifths of the orange trees. The number for the State increased nearly five times in 10 years. Orange and lemon shipments increased about eight-fold in the decade. San Diego and Los Angeles counties contained more than half the lemon trees of the State, the number being more than 18 times as great as 10 years before. There were 5,648,714 orange; 1,493,113 lemon; 1,530,164 olive trees in the State.

Strawberries, blackberries, raspberries, loganberries and other small fruits are valued at about $2,000,000. Fifty-two of the 57 counties raise grapes. California is the principal wine-producer of the Union, yielding more than one-half the total product.

Viticulture.— California has over 90,000,000 grape-vines (more than all the rest of the Union), occupying 356,009 acres; representing an investment of $150,000,000. The State shipped in 1916 10,741 carloads, valued at $13,000,000. It is the only raisin State. In 1916 it shipped (from 22 counties, though Fresno is centre) 128,500 tons of raisins. The seeded-raisin industry began in Fresno County, and has grown from 3,500 tons in 1897 to 45,000 tons in 1916.

GRAPE PRODUCTS, 1916	Quantity		Value
Dry wines........	23,000,000	gals.	$14,500,000.00
Sweet wines........	19,262,475	"	
Brandy...........	3,027,892	"	
Grape juice........	50,000	"	50,000.00
Champagne........	1,000,000	bottles	2,000,000.00
Table grapes......	11,741	carloads	11,000,000.00
Raisins...........	128,500	tons	16,000,000.00

The best «dry» wines are grown almost exclusively in the northern half of the State; the best sweet wines exclusively in the southern. The recent (1917) vote in Los Angeles prohibits the use of beverages above 14 per cent alcohol after 1 April 1918. This is the largest city in the West thus to restrict. It permits the 14 per cent clarets of the North, but inhibits the 21 per cent ports, sherrys and other fortified sweet wines of the South. California is committed to a policy of «local option,» as regards the liquor problem, but the great majority of the smaller cities are (nominally) «bone dry.» On 1 April 1918, the 200 saloons in Los Angeles (600,000 population), closed their doors, being «voted out» by a large city majority. It was then the largest city in the Union without liquor license. The effect of the «prohibitory» movement on the whole grape industry and the 100,000 persons directly dependent upon it can be inferred. The ordinance was voted in November, and became effective only four months later. This was virtual confiscation of several million dollars in stock, leases, licenses, fixtures, etc. At the same time there were still 1,750 places in San Francisco where «hard drinks» could be secured.

Mining.—As early as 1690, Loyola Casallo mentions seeing placer gold in California; large nuggets were described (by Antonio Alcedo, 1786) in the 18th century. Not later than 1841, gold was found on San Francisquito Creek, Ventura County, about 45 miles from Los Angeles, and was «washed» there by Mexicans on a modest scale. On 19 Jan. 1848, James W. Marshall, an American from New Jersey, employed by the Swiss pioneer, John Sutter, in building a saw-mill near Coloma, on the north fork of the American, picked up yellow metallic flakes in the mill-race; the news spread in spite of efforts to suppress it, and in a few months the gold rush was on. Up to 1848 the whole United States had produced less than $12,000,000 in gold since the discovery of America; in five years following, California alone yielded over $258,000,000. The annual gold product of the State, from the discovery to 1859 inclusive, was in million dollars, 5, 10, 45, 75, 85, 65, 65½, 65, 57, 50 and 50. The total gold output from 1848 to 1 Jan. 1918, was $1,673,594,500. It now averages 21½ million per year. This first bonanza in United States history had a profound economic, sociologic and political effect. «Sound money» was as yet unknown in this country; silver and gold together in the whole Union up to 1848 had not reached $25,000,000 in total output; and the instability of the currency prior to the California gold discovery is familiar to students. The California gold-find not only precipitated such a shifting of population as had not before been dreamed of on this continent; it not only brought about the admission to the Union of a State distant 2,000 miles from any other State,— California was the first State in the geographic western half of the United States, and sixth west of the Mississippi River,— it furnished the finances for the great civil cleavage nominally most concerned with slavery, and gave the free States a majority in the United States Senate. It is probably not fanciful to hold that this «irrepressible conflict» could not so soon have opened had the nation been so short of bullion and of credit as it was prior to the gold discovery of 1848. Furthermore, in 1859, almost exclusively with California capital, labor, enterprise and machinery, the great silver bonanzas of Nevada (just across the Sierra) began the remarkable record of 21 years, in which they produced over $306,000,000 in bullion.

The first mining in California by Americans was crude, as it had been in Mexican days — «washing out» the auriferous gravels in the «gold pan.» The first step in advance was the «rocker,» employing two men, and foreshadowing a certain associative effort. Next came the «Long Tom,» which made also for stability, since it could not be carried. Then came the sluice-box, a small wooden flume with wooden riffles on the bottom, behind which the gold sank and was saved, while the lighter sand and gravel were swept on by the swift current. In 1852, E. E. Matteson, a Connecticut Yankee, invented hydraulic mining, the greatest advance ever made in the placers. Water under high pressure, served through a nozzle called the «monitor,» thrown 200 or 300 feet with such nozzle force that a crowbar could not be thrust into the jet, ate away whole hillsides almost as hot water disintegrates sugar, the detritus passing through long riffled sluice-boxes. While this invention was the most essential yet made in mining, it was long disastrous to ultimate development of the State, agriculturally. In 1880 it was proved by engineers' measurements that on the Yuba River alone more than 100,000,000 cubic yards of gravel had been washed by hydraulics into the bed of the stream, raising it 70 feet, and burying 15,000 acres of farm lands under the débris. After a long and bitter fight, the «anti-Slickens» campaign ended in 1884 in favor of the agricultural interests, and hydraulic mining in California has never since been on a large scale.

«Quartz mining»— that is, deep mining on the original veins from whose waste the placers derive — began in 1851, but did not take chief rank for many years. Now it is the principal form of gold mining in this State; and as it requires large capital, experience and time, gold mining no longer attracts the multitude, though the State annually produces three times as much gold as set all the East in a fever three-fourths of a century ago. California is the only ante-bellum State in the Union which has never had «soft money» or a depreciation of currency. The largest mint in the world is located in San Francisco.

In the 'sixties, extensive experiments were made by Thomas Scott of the Pennsylvania Railroad to develop petroleum in California, even shipping around the Horn barrels for the expected product. For various reasons, chiefly administrative, the experiment failed.

Petroleum.— In 1875, J. D. Whitney (of Yale), perhaps the greatest geologist of the United States, and for years State geologist of California, stated that while there «were surface indications of petroleum, it was geologically impossible that California should become a great producing petroleum State, and there could not be flowing oil wells like those of Pennsylvania.» The enormous surface indications in many parts of the Coast Range tempted further exploration; and within a year after Professor Whitney's prophecy, oil was struck in Los Angeles County at Puente; and soon thereafter in Los Angeles City and also in Ventura County. By 1893, there were about 100 wells in California producing in the year 400,000 barrels. By 1900, the annual product had increased to 4,324,484 barrels, with 1,590 producing wells, and 470 drilling. In February 1918, the total number of producing wells was 8,158. A majority of the California oil wells are flowing when first tapped. The famous «Lake View» spouted about 90,000 barrels a day for a long time, and continued to flow for more than a year. Other wells have spouted from 30,000 down to 10,000 barrels a day. The life of a flowing well varies from six months to three years. For these great gushers, whole valleys are dammed up as reservoirs are dammed for water; and the petroleum product makes lakes of large size. The oil fields touch 17 counties in a line over 600 miles long. The vast majority of the product is in eight counties in the south in the following order (1916):

COUNTY	Barrels	Value
Kern	54,120,509	$34,691,246
Fresno	14,594,246	7,530,631
Orange	13,198,591	8,750,666
Santa Barbara	4,502,206	3,574,752
Los Angeles	2,875,468	1,871,930
Other counties	971,537	1,002,109
Total	90,262,557	$57,421,334

Oil wells are from 700 to 4,000 feet deep. In the Summerland district, in Ventura County, most of the production is from wells put down in the bed of the ocean from piers. Thousands of miles of pipe-lines deliver at tide-water the product from Kern River and other districts. In 1916 (except for Oklahoma which has recently outstripped it) California produced nearly 50 per cent of the total petroleum of the United States and over 10 times as much as Pennsylvania.

California locomotives nearly all burn crude petroleum, as do the steamers. Steam and electric roadbeds are «oiled» for thousands of miles. An overwhelming majority of the manufacturers of the State use it for fuel. It is equivalent to coal at about $3 per ton. There can be no fuel famines in California. The mud road has disappeared from the progressive sections. Farmers drive (mostly by auto and truck) to market over unsurpassed boulevards made by mixing the universal disintegrated granites with crude oil and steam-rolling the surface. The production of natural gas increased from $34,578 in 1900 to $2,871,751 in 1916 — a gain of 82 times in 16 years. Twelve counties produce this commodity but the output is overwhelmingly from Kern (over 60 per cent of total), Santa Barbara, Orange, Fresno, Los Angeles and Ventura counties, in that order. One pipe line (the «Midway») transmits 23,000,000 cubic feet per 24 hours, and is 107 miles long. In 1916 there were 31 plants in the State making gasoline, having an aggregate capacity of 61,400 gallons per day. The petroleum of California in its varying forms has not only been one of the greatest industrial and economic factors of the State, but has contributed to Paleozoology the most extraordinary find in history — not even surpassed by the remarkable deposits of actual fossils at Agate Springs, Neb.— the «La Brea Rancho,» partly within the city limits of Los Angeles, discovered in 1906, a unique preservative of Pleistocene remains. In a space of about 1,400 feet long, northwest by southeast, and 150 feet wide, thousands of skeletons have been discovered, of which many were before unknown to science. In the same area, crude oil is still bubbling up; and jackrabbits, owls and smaller animals are caught in it at night, taking it for water, and being «bogged down.» In the Pleistocene period, southern California was a tropical jungle roamed by the largest land mammals. The drying up of the region, the extinction of tropical forests and of lakes and water-courses, brought about the rapid extinction of these ancient species. On the «La Brea» is a little pond of about an acre of asphaltum springs, still bubbling. In Pleistocene days, the Imperial elephant came down here to water, and was caught in this oleaginous quicksand. Sabre-tooth tigers sprang upon their backs and devoured them alive — and other tigers disputed the prey; and all slowly sank down to be preserved hundreds of thousands of years for science, to-day. The skeletons of 50 species of mammals and 50 of birds have been exhumed here, and new material is constantly coming up. The great bird of 14 feet wing spread — the teratornis — is the largest of the winged creation found here. The sabre-tooth tiger was known to science before, but none with tusks reaching below the lower lip. In this incomparable cemetery have been taken out, already, 630 sabre-tooth tigers with an average length of 10 inches for those great canine teeth, seven inches below the gums. The first complete skeleton of the Imperial elephant was taken out here; and 16 other specimens have been found. Over 700 of the «big wolves»— very much larger than the modern timber wolf; 7 mastodons; 39 giant ground sloths; 39 bison; 39 horses and 39 camels, and new varieties of the little sloth, the antelope and a cat as large as the jaguar (whereas the puma was before the largest, except the lions and tigers). Other museums have fragments of the giant ground sloth; but the only complete specimen is from here. Of the little sloth, here are the only 11 skulls known. This is the only place known in the world where bones have been preserved in asphalt. They are not fossils, and their durability is a matter of surmise, though they are in perfect preservation and not friable as if they had been buried in soil. The Museum of

History, Science and Art, in Los Angeles, has a vast quantity of material unmounted, and 15 examples mounted of the most important of these unique prehistoric creatures. The owner of «La Brea» has donated 32 acres of this waste land, and Los Angeles County will build a park and subsidiary museum on the spot around this death-pit, which attracted these forgotten animals of the Pleistocene period. The petroleum «trap» will be maintained as it has been for so long; except that it will show the modern excavations and some bones *in situ*.

Mining Output in 1916 and 1917.— California, while first in present annual output of gold, is overwhelmingly first in total production; having produced more than all the rest of the United States put together. It is second in output of copper, eighth in silver, first in borax and soda, second in petroleum, fifth in salt, first in asphaltum, tungsten, quicksilver (with two-fifths of the total production of the world); and with a range of mineral productions entirely without parallel in North America.

The principal products with their respective values were (1917):

Gold	$22,500,000
Copper	17,000,000
Petroleum	57,421,334
Quicksilver	2,500,000
Potash (by kelp)	2,700,000
Potash, mineral	2,200,000
Silver	1,400,000
Other	39,478,773

In 1917, total value of mineral products for California was $142,100,107, excluding kelp and many other products amounting to about $6,000,000.

Interesting other items in mineral production (1917) were

Borax and soda	$3,000,000
Cement	6,100,000
Brick	1,600,000
Lead	1,000,000
Natural gas	2,871,751
Tungsten concentrates	4,000,000
Zinc	2,000,000
Building stone	5,100,000
Chromite	200,000
Mineral water	470,000
Pyrite	295,000
Pottery clay	135,000
Lime	285,000
Magnesite	800,000
Manganese ore	200,000

The total metal output of the 589 active mines of California for 1916 amounted to a value of $39,749,263, a figure $7,485,419 greater than for 1915, and a new record in the mining history of the State. But this increase is to be attributed to the greatly enlarged output of copper, zinc and lead; for the gold output showed a falling off of $1,031,555. In detail, the year's record shows: gold, 1,035,744.6 ounces, valued at $21,410,741; silver, 2,564,354 fine ounces, valued at $1,687,345; copper, 55,897,118 pounds, valued at $13,750,691; zinc, 15,256,485 pounds, valued at $2,044,369; lead, 12,407,493 pounds, valued at $856,117.

The reduction in the gold output was nearly all in the deep-mine production, and is laid partly to the two months' strike of miners in the Mother Lode district, and partly to the higher wages paid at the copper mines, which drew away a considerable body of miners. The placers are credited with 40 per cent of the total yield, as compared with 38 per cent for 1915. More than seven-eighths of the placer total was recovered by the 53 dredges throughout the State. The largest dredging operations were carried on in Yuba County, where 13 dredges, some of them the largest ever built, were at work during the year. Some platinum also was obtained by the dredges. The largest output of copper was in Shasta County, which produced 50 per cent more than in 1915. The lead output was nearly three-fold that of 1915, and nearly all came from Inyo County. Shasta and Inyo counties produced nine-tenths of the zinc output, and San Bernardino County the remaining tenth. The total tonnage of ore mined and treated in California in 1916 was 3,187,642 short tons. From this was recovered an average value of $9.77 per ton — a figure surpassing the former record ton-value of $7.87, made in 1915, by 24 per cent.

Minor mineral products (1917) by thousand dollars: Antimony 5, asbestos 5, barytes 10, bituminous rock 60, coal 25, dolomite 15, feldspar 7, fuller's earth 4, gypsum 45, infusorial earth 60, iron 3, limestone 155, marble 40, platinum 25, potash 25, silica 35, soapstone 15, soda 85.

Manufactures.— For its first 80 years entirely pastoral, for its next 20 years chiefly mining, for the next 60 years overwhelmingly devoted to agriculture, horticulture and viticulture, California has in the last decade (to 1917) become the ninth manufacturing State in the Union. This is due not alone to the vast range of productivity but still more to the unprecedented development of petroleum-fuel and hydro-electric power. Between a population of 92,597 in 1850 and 2,938,659 in 1916, California's population increased 31-fold. Its economic progress has been perhaps as surprising. The United States census of 1914 shows nearly 5,000 manufacturing industries, of which 71 produce more than $500,000 a year each (including four that exceed $50,000,000 and 11 between $10,000,000 and $50,000,000). Value increased, in five years, more than value increase of United States as a whole.

	1899	1914
Number of establishments	4,997	10,057
Persons engaged	*	176,547
Capital	$175,467,806	$736,105,455
Salaries and wages	47,385,354	140,842,691
Value of products	257,385,521	712,800,764

* Figures not available.

Percentage of increase 1899–1914, establishments 101.3; average number of wage-earners, 80.6; value of products, 176.9; value added by manufacture, 186.1.

Aside from manufacturing products covered in other tables for petroleum, fisheries, fruit and vegetable canning, lumber, etc., some important manufactured products may be assembled as follows:

CENSUS 1914—INDUSTRY	Establishments	Value of output
Slaughter-house and meat packing	108	$50,011,820
Printing and publishing	1,543	34,744,879
Foundry and machine-shop products	1,097	31,732,384
Flour and mill products	132	24,078,735
Bakery products	1,117	21,855,181
Butter, cheese and condensed milk	201	20,466,428

See also, elsewhere, statistics of oil refining, packing fish, fruit and vegetables, etc., under their headings.

Detailed statistics of minor manufactures may be found in the census of manufactures of the Department of Commerce, United States of America.

Even in the four years since the issue of the last (1914) bulletin, enormous changes have taken place in nearly every item.

The canning of fruits and vegetables has reached its highest development in California; and in output this State easily leads the Union. More than one-half of all the canned peaches; more than two-thirds of all the canned pears; nearly one-half of all the canned cherries; nearly four-fifths of all the canned plums; more than one-half of all the canned beans; more than one-half of all the dried fruits, produced by the whole United States, are from California. The increase in all items of manufacturing had been by far largest in Los Angeles, where, for instance, the percentage of increase in a decade (to 1905) had been in number of establishments, 88.7; number of wage-earners, 107.7; value of products, 115.3. Another new, but highly important industrial advance, is the long-distance transmission of electric power from mountain streams. In this California has for years led the world. When a 33,000-volt, 82-mile line from San Bernardino Mountains to Los Angeles was installed (1900), it far exceeded any other line in the world in length and voltage. Then 40,000 volts were brought 140 miles from Yuba River to Oakland — with cable crossing Carquinez Straits by suspension span of 4,400 feet, 300 feet in air. The longest power transmission in the world was that from Colgate to San Francisco, 211¾ miles. Plants have been built to transmit 28,000 horse power from Kern River, 116 miles, to Los Angeles; and 120,000 horse power from San Joaquin River, 180 miles, to San Francisco; and 218 miles to Los Angeles. One electric company expended $250,000 per month for a year, in electric development in and around Los Angeles. Two companies in the northern part of the State are developing 169,000 horse power for long-distance transmission. Not only are nearly all streets and houses lighted, and street-cars propelled by this new, far-fetched "fuel," but thousands of the smaller manufacturing establishments are run by hydro-electric motors.

The first hydro-electric plant in the world was operated at Frankfort-on-Main, in 1894; the second (first commercial) at Folsom, Cal., in 1895 to light Sacramento (State capital). California was not only a pioneer, but still leads in hydro-electric development. In 1917 there were about 85 plants in California with aggregate maximum capacity of 9,000,000 horse power; which will be greatly increased by plants now building. There are lines carrying as high as 150,000 volts, operating at "heads" of over 2,000 feet, or a pressure of approximately 875 pounds per square inch.

For the last 20 years ship-building has made a great advance, and California became the third State in the Union in this industry. The *Oregon, Olympia, Ohio* and other United States war vessels were built in San Francisco. Long Beach, Los Angeles County, has also become important in the building of war ships. The first successful concrete vessel was launched in 1918, and large vessels of different types are on the way.

Commerce and Navigation, etc.— The position of California (commanding, from the best seaports in 5,000 miles of the Pacific Coast, the shortest routes to the Orient), is reinforced by its enormous coastline. The littoral of the United States is divided practically into thirds — Atlantic, Gulf and Pacific. California has two-thirds of the total United States frontage upon the Pacific Ocean, and nearly one-fifth of the total coastline of the United States. All this, added to its relation as outlet for an enormous inland territory, including not only California but New Mexico and Arizona, gives great importance to its commerce. San Francisco (1905) though the 11th city of the Union in population was third in commerce. Its exports for 1916 were $127,598,531 and imports $117,128,253 (including exports to China $4,857,956 and to Japan $24,818,324). Operations in the Philippines and development of the Oriental trade are bringing about for California the realization of Seward's prophecy (about 1865) that "the Pacific is to be the chief theatre of the world's activities." The Bay of San Francisco, with a shore-line of 300 miles, open to the ocean only by the mile-wide Golden Gate, and receiving through the two great central rivers the drainage of the vast interior valley, is reckoned among the world's best harbors. San Diego at the extreme south has a well-sheltered natural harbor, entrance to which has been improved by the government. Los Angeles harbor (formerly San Pedro) is the most important artificial harbor and ranks close second to San Francisco. Other roadstead wharves serve rapidly growing commerce. California had, in 1917, 19 lines of ocean steamers — plying to China, the Philippines, Sandwich Islands, Alaska, Mexico, Panama, Chile, and 13 coastwise. Of six lines of river steamers, five concern San Francisco and its river system. The Sacramento River is navigable to the city of that name.

Kelp.— In 1916 an important industry, unique to California (and practically confined to southern California) was initiated by the Los Angeles Chamber of Commerce, largely through the instrumentality of the director of the Southwest Museum. This was the systematic harvesting of the vast beds of kelp (*macrocystis pyrifera,* with also the *pelagophycus porva* and *butkeana*), which skirt the littoral from about Point Concepcion to San Diego. These kelp beds cover 50,000 acres. "Kelp pirates" had for several years ravished the beds to a small degree by a crude method, and extracted the potash still more crudely; destroying the plants which they tore out by the roots, and causing great havoc among the young fish, of which the most important have their spawning-beds and nurseries in this same kelp field. State legislation has now been secured to regulate the harvesting of the crop by scientific methods, so that it will be enduring. Kelp is "the alfalfa of the sea." The more it is cut (scientifically) the better it thrives. There are (1918) eight corporations with plants, with an investment of $6,000,000, "heading" kelp with a fleet of special boats of 12 to 600 wet-tons capacity, and with reciprocating knives which cut the kelp not over five feet below the surface, without any injury whatever to this curious marine plant, or disturbance to the myriad fish-spawn sheltered thereby; and carry the harvest to be treated in great modern plants.

The product of potash (selling in 1918, at $450 a ton, multiplied about 700-fold), amounts to $2,700,000. The wet-tons harvested in 1917 were 400,000; yielding 6,000 tons of potash at 1½ per cent of potash to the wet-ton. The large content of ammonia and iodine by-products is very important, and is already being saved — though too recently for accurate statistics. The harvest, under this scientific treatment, lasts all the year, three crops annually; the average, per acre, being 7½ wet-tons. No method is yet known of increasing the acreage of the kelp beds; but under the present system the crop will be perennial. About 75 per cent of the possible gathering is now harvested. On account of its vital relation to the important fisheries of California, the administration of this industry has wisely been placed under the control of the State game and fish commission. Whether to be rated among the «agricultural,» «manufacturing» or «marine» products, this «Sea Alfalfa,» in view of the constant value of potash, ammonia and iodine, the inexhaustible field, and its proximity to factories by rail make this extraordinary industry of southern California worthy the attention of economists.

The first commercial production of potash in California was in 1914 from 10 tons of kelp. The first potash derived from «mineral» sources was produced as a by-product from «cement treater» dust, at Riverside, in 1915. The yield of potash from purely mineral sources for 1917 was approximately 120,000 tons, valued at $2,200,000. This is principally from the «cement treater» dust in Riverside County and the evaporation of the natural brines in Searles Lake, San Bernardino County. Eight corporations are now engaged in the manufacture of mineral potash; and in spite of the youth of this industry, it is already important. The development of the mineral industry is barely begun, and its potentialities can hardly be estimated. The kelp potash can be practically measured as above. But the mineral potash cannot be. But it is the consensus of producers that there is an enormous possibility for the mineral potash industry in the great deposits now being developed in California.

Fisheries.— In 1865 there were 650 vessels, manned by 15,000 men, engaged in whale fisheries in the Pacific. The centre of the industry was San Francisco. Half a century later, San Francisco was still the foremost whaling port of the New World, but the industry had shrunk to $132,000. Long Beach, southern California, is important in this fishery; whale meat has become a valued market food. The State is the richest in marine and fresh-water fish; and ranks second or third, at present, in the canned pack. This was until recently almost altogether salmon. But within a few years the so-called «Tuna» (really the albacore), and the sardine have become rivals of the salmon pack. The centre of this industry is in southern California, at Los Angeles Harbor (formerly San Pedro). Another important fishing and canning point is San Diego. The total pack for southern California, 1916, was:

Fish	Cases	Value
Tuna	560,000	$3,360,000
Sardines	500,000	2,000,000
Miscellaneous	100,000	300,000
Total	1,160,000	$5,660,000

The value of the salmon pack (entirely confined to northern California) was, for 1916, approximately $8,375,000. The sardine pack, for northern California, for 1916, had increased from 50,000 cases to 250,000 cases. Japanese and Chinese and other alien fishermen dry large quantities of fish which are not recorded in State or Federal statistics. Throughout, the fishermen are about 90 per cent aliens. Statistics are not readily available, under a loose system of State supervision. Probably now that the government has taken control of the food supply it will soon be easy to get some accurate idea of this product, which is enormously larger than the recorded statistics. Among the most important marine fishes are the chicken-halibut, sole, tom cod, rock cod, rock bass, mackerel, Spanish mackerel, barracuda, pompano, sand-dab, red snapper, flounder and other valued varieties, besides many fish of lesser estimation. These marine fish are in the market the entire year, at reasonable prices. The San Francisco market lists 133 varieties on sale by seasons. Of the fresh water fish, the striped bass of the Sacramento River is an esteemed delicacy. Salmon, sturgeon, steel-head trout, rockfish and smelt, running from sea to stream, are abundant and famous. Within the last 30 years all varieties of trout (besides the native) have been successfully colonized in California, which now exceeds any other State in the variety, size and abundance of trout. Black bass, shad, codfish, crab, etc., have also made handsome growths here. For game fish and sport, California is admitted to lead the world not only in trout and black bass, but in the marine fish, like the «leaping tuna» of Catalina Island, which has built about itself an international annual tournament with cups and gold medals and strict laws. The record tuna of 251 pounds and the black sea bass of 380 pounds were taken with light rod and reel and 21-strand line. The coast is very rich in shell fish. It is against the law to have in one's possession a crab less than six inches in diameter. But though large, they are delicious. Shrimps are abundant. Crawfish, like the eastern lobster in flavor but without mandibles, are abundant. The native oyster is small but flavorsome; and eastern oysters propagate well here and are excellent in flavor. Mussels, clams, razor-shells, cockles and other edible mollusks are in great abundance. The mollusk most prized by the epicure, though still little known, is the abalone. Its beautiful shell is familiar to collectors all over the world, when polished — a beautiful nacre univalve, measuring from six inches longer diameter, upward (six inches being the minimum allowed by law). It requires much labor to pry it from the rocks, and still more to beat it into edibility; but when properly macerated it is deemed the highest delicacy in the market. All game fish, as well as all game quadrupeds and birds, are protected by strict State laws, rigidly enforced. The State has 12 fish hatcheries, turning out annually, of fry: trout, 17,000,000; quinnat salmon, 20,000,000; shad, 1,000,000.

The Mount Shasta hatchery produces more salmon and trout fry than any hatchery in the world. Besides these State hatcheries, there are four hatcheries and egg-collection stations under Federal control.

The value of marine fish, fresh, in 1917 was $11,795,000; packed, $15,235,000; a total value of $27,030,000.

Railroads and Street Railways.— In 1870 the State had 525 miles of railways, 7,529 in 1910 and 12,145 in 1916. This mileage pertains chiefly to the great transcontinental lines of the Central and Southern Pacific and the Atchison, Topeka and Santa Fé, with much more than half the total. There are three other railroads of over 500 miles each, five more of over 100 miles and 39 shorter lines. Several other transcontinental lines have terminals in Los Angeles over leased trackage; and the "Salt Lake" (San Pedro, Los Angeles, and Salt Lake) running over its own rails 586 miles, except about 60 miles, leased. In 1870 there was no urban rail transit whatever. In 1873 Hallidie in San Francisco invented the first successful urban rapid transit in the world; and the resultant cable system is still probably without parallel, as is also the urban and interurban electric system centred in Los Angeles. In 1916 there were 3,032 miles of electric railways in the State, more than half in four counties of southern California. These interurban electrics run 50 to 70 miles an hour, on 110-pound rails. The principal lines are Pacific-Electric (Los Angeles), with trackage of 1,059 miles; Los Angeles Railway, 392; United Railroads, San Francisco, 286; San Francisco-Oakland terminals, 263; Northern Electric Railway, 165; 30 other roads, 865.

State Finances.— State bonded indebtedness, $39,073,500; bonds voted but not sold, $23,875,000. Except for the Panama-Pacific Exposition, the State has levied no ad valorem taxes on real or personal property since 1910. Its principal revenue is from taxes levied against gross receipts or value of franchises of corporations. For the fiscal year 1917–18 these amount to $16,344,275.

Total assessed valuation of State (1917): realty, $1,860,963,460; personal, $1,861,642,947; total, $3,722,606,407.

Banks.— The great immigration of "well-to-do" people has proportionately increased the banking business. In 1917 there were 264 national banks as against 147 in 1909 and 421 State banks as against 239 in 1909. The clearings in 1916 aggregated $5,531,109,926 and $7,295,714,819 in 1917. On 30 June 1916 the total bank deposits were $997,635,191.66, of which $468,716,944.43 was in commercial and $528,918,247.23 in savings banks.

Education.— California probably still leads the Union in proportionate enrolment of college students, having 1 to every 419 of total population, and surpasses New England in pro rata of pupils in secondary schools. The following table shows the present status and the recent progress in education in California:

	1910	1917
Number of normal schools	5	8
Number of high schools	185	435
Number of elementary and kindergarten	2,119	5,009
Teachers in public schools	10,769	19,074
Pupils in public schools	349,145	569,284
Value of school property	$38,661,701	$92,800,821
Annual expenditure for schools	6,000,000	34,133,122
Number of colleges		13
Number of students enrolled in colleges		15,136

California has two great free universities. The State University at Berkeley ranks high among American universities in number of undergraduates, and in total number of students is exceeded only by the University of Chicago, New York University and Harvard. It is about 14th in size among the universities of the world. Resources, $7,260,000; supported by State tax of two cents on every $100 valuation. Mrs. Phœbe A. Hearst, widow of United States Senator Hearst, has contributed great sums to the university, and has secured in a competition open to all the world (won by M. Bénard of Paris), a complete architectural plan whose buildings will cost at least $10,000,000. Leland Stanford Jr. University was founded in 1891 by Governor and United States Senator Leland Stanford and wife. The widow later turned over to the university the complete endowment they designed, amounting to nearly $30,000,000. A harmonious architectural plan, of symmetry and beauty unrivaled at present by any university in the world, has already been carried far enough to accommodate the 1,200 students (of whom one-third are women) and has cost several millions. University affairs in California are in the hands of noted educators from the East; standards are high, and friendly rivalry has done much to promote educational affairs throughout the State; while the two universities have together over six times the enrolment that the one had a generation ago. The accrediting system has been developed to high efficiency. Coeducation in both universities is not an experiment, but acknowledged success. There is a large number of colleges, private schools, seminaries, academies and other educational institutions, besides those under State supervision; also medical law, art, music, dentistry, business and other schools. Educationally, California ranks very high in the Union. A large number of distinguished teachers have been attracted by climatic and other considerations. It pays its teachers in public schools an average salary of $943.

Public Libraries.— There are in the State (1918) 826 public and semi-public libraries, including institutional and professional (school, college, law, medical, etc.), besides 111 association and 33 subscription libraries. The "free county library" has become an important feature for outlying rural communities, giving them most of the advantages of a great urban library. Forty-one counties maintain these. The branches of the free public libraries number 2,836. Total number of volumes (1916) in 127 leading free public libraries, 3,319,667. There are 175 library buildings; 18 built by their communities, 144 by Andrew Carnegie (in which case the community furnishes the site and a permanent annual maintenance of 10 per cent of the endowment) and 13 by other donors. The largest public libraries are in Los Angeles, San Francisco, Stockton and Oakland. Library schools are maintained by the State Library at Sacramento and the Riverside Public Library. There are training classes at Los Angeles and other points.

In proportion to population, California has twice as many periodicals as New England. At the last Federal census there were in San Francisco alone 242 in 13 languages. In 1914 (United States Department Commerce) there were in the State 975 publications in 16 languages, including English, which had of course the vast preponderance in number and circulation. There were 15 foreign-language dailies — including five each in Chinese and Japanese, two each in French, Italian and German and representatives in Portuguese, Spanish, Greek, Swedish, Danish, Croatian, Armenian, Serbian, Hungarian and Russian.

California periodicals, 1914 (United States census):

PUBLICATIONS	English	Circ.	Foreign-language	Circ.
Dailies	162	1,340,807	16	81,655
Weeklies	498	623,242	31	59,300
Monthlies	159	1,073,867	7	48,500
All others	91	807,271	11	51,636
	910	3,845,187	65	241,091

Largely populated by educated people from all over the world, and of recent migration, California has extraordinary activity in all educational, philanthropic, religious, fraternal, literary and similar organizations. The Y. M. C. A. has 68 associations with 30,641 members, $4,000,000 value in buildings, $852,000 annual expenditure. Los Angeles has the largest association in the State, and probably in America, with (1917) 8,095 members, $902,841 value in buildings and $433,772 annual expenditures. The Association raised in 1917 $2,360,000 for war and other purposes.

The Y. W. C. A. has 12 city, 14 student and 1 county associations, with total membership 34,820; valuation of buildings $927,208; annual expenditures $390,393. A special quest for funds in 1917 raised $450,000. Particular stress is laid on work among younger and immigrant girls. The California Federation of Women's Clubs numbers 485 clubs and 38,893 members (1917). The war greatly stimulated humanitarian work already existing, and caused the formation of scores of new organizations. The Red Cross raised in its June and December 1917 campaigns in Los Angeles County alone over $1,022,000.

California includes as residents many famous musicians. Los Angeles is one of the few cities in the United States which maintain a symphony orchestra. Communal singing has not advanced as far here as in a few other cities, though it is in progress; but there are few cities where good music can be heard so abundantly and so cheaply. The Bohemian Club of San Francisco and the Gamut Club of Los Angeles are internationally famous; and there are many musical, theatrical and other clubs throughout the State, besides women's clubs, which have been of serious import in the development of musical and art culture.

Other organizations peculiar to the State are the Native Sons of the Golden West and the Native Daughters of the Golden West, patriotic associations composed of persons born in California — perhaps the only State in the Union where such a thing obtains. Each numbers tens of thousand of members and scores of local chapters, called «Parlors.» The Landmarks Club was the first corporation in the United States to save historic monuments, and has done a great work in preserving the old missions of California. There are half a dozen museums of scientific importance in the State — in Berkeley, San Francisco and Stanford, with the Southwest Museum in Los Angeles and the County Museum, with its wonderful array of Pleistocene semi-fossils.

Churches.— Though founded and civilized by the Catholic Franciscan Friars in 1769 (the first Protestant sermon being preached here 80 years later), California is richer per population in Protestant churches than most of the Puritan States; having (1916) 2,370 Protestant churches, valued at $21,400,565; membership 328,631 (an increase of 60 per cent in 10 years) and under 25 denominations. These churches contributed to missionary purposes in 1916 $1,650,926. Los Angeles city had 281 Protestant churches with 58,685 members or 10 per cent of the population. San Francisco had 100 such churches with 15,713 members, or 3½ per cent of the population. Los Angeles County leads the State with 104,418 members or 31 per cent of total Protestant membership of the 58 counties. Alameda comes next with 21,750 members. Twelve denominations maintain 17 Protestant religious schools and colleges, of which more than half are in southern California. It is widely recognized that lack of co-ordination causes great wastefulness in this church work.

The Christian Science churches have multiplied in number and membership very greatly in the last decade; but no statistics are available. They are not included in the list of Protestant or other churches.

The Catholics have 539 churches, of which 298 have resident priests, 155 mission stations, 15 orphan asylums and 8 homes for the aged.

Church membership is as follows:

CHURCHES	Members
Methodist	92,065
Presbyterian	50,704
Baptist	41,503
Congregational	32,640
Christian	32,522
Episcopalian	28,584
All other 19 Protestant denominations	50,613
Total Protestant	328,631
Catholic	523,233

Charities and Penal Institutions.— California has two State prisons, three industrial reform schools, five asylums for insane, one for deaf, dumb and blind, and a great number of public and private hospitals, asylums, orphanages, etc. There are 64 orphan homes, of which 38 receive State aid. There is also a Federal prison on Alcatraz Island in San Francisco Bay.

Military and Naval Establishments.— There are garrisons and fortifications at the harbors of San Francisco, Los Angeles and San Diego — respectively «The Presidio,» Fort MacArthur and Fort Rosecrans. There is also a navy yard at Mare Island, and an arsenal at Benicia. The largest training camp in California in the Great European War was Fort Kearney, located near San Diego. Under contract with the government there is being built in 1918 a large number of wooden and steel and concrete ships, of 3,000 tons and upward, for commerce during and after the war. This ship-building is almost exclusively in Los Angeles Harbor, Long Beach and San Francisco.

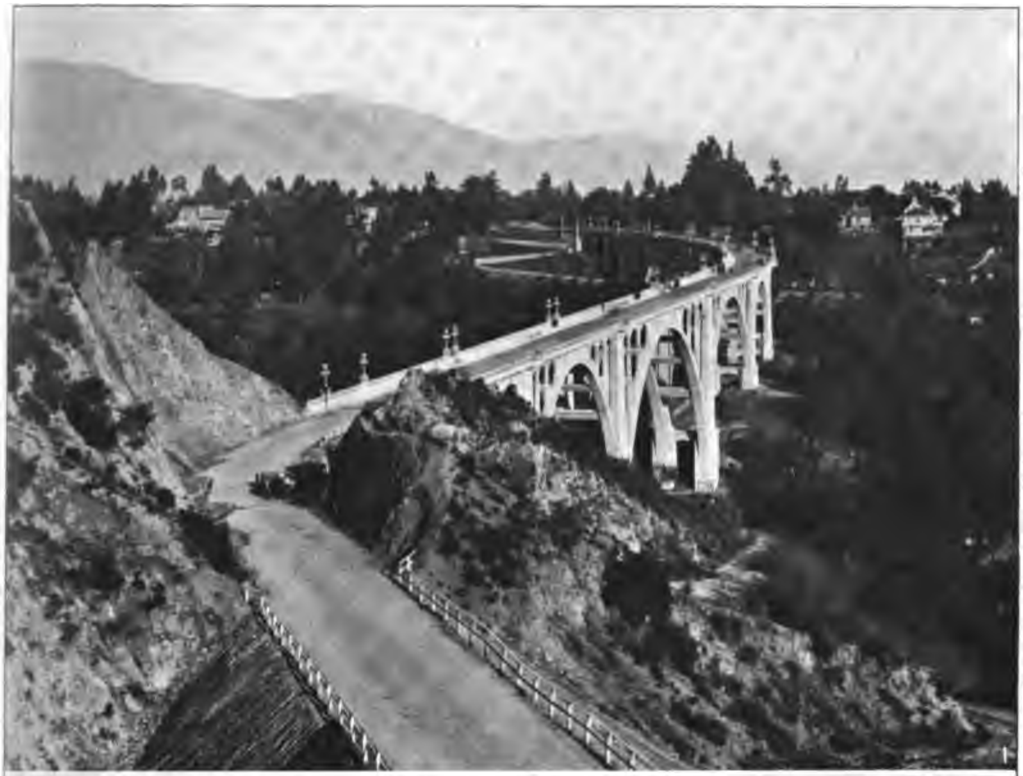
State Government.— State officers elected for four years, except assemblymen for two; no bar to re-election; governor's salary, $6,000;

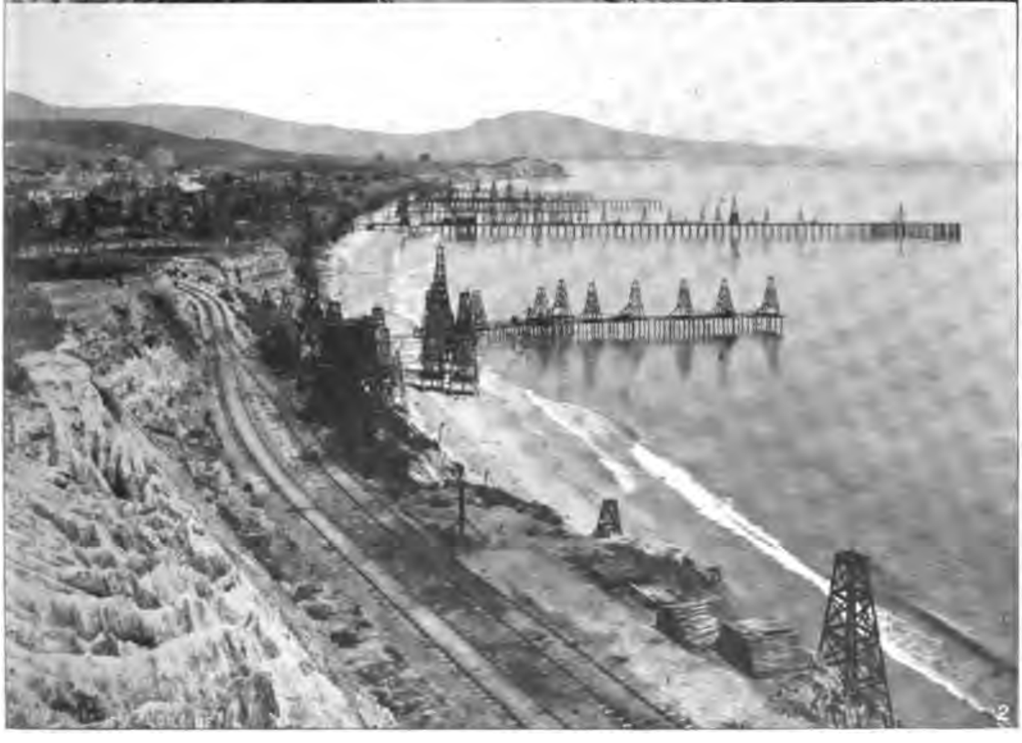
two-thirds vote in each house passes bill over governor's veto. If he does not act on any bill within 10 days, it becomes law, unless adjournment of legislature prevents return of bill, in which case it becomes operative if within 10 days after such adjournment the governor approves it. Legislature limited to 40 members in senate, 80 in house; meets biennially, in January of odd-numbered years. Sessions not limited, but pay allowed members for only 60 days — $8 per day, with traveling expenses and mileage 10 cents per mile. No bill can be introduced after 50th day of session. State constitution is notable for numerous restrictions on legislative action; provision for three-fourths' majority verdict of juries in civil cases; and prohibition of Chinese suffrage and of employment of Chinese on State works, or by corporations. The initiative, referendum and recall are also in full use. California was sixth State to adopt "Woman's Suffrage." There are 40 State commissions, expending annually nearly $5,000,000. California is represented in the National Congress by two senators, nine congressmen (prior to apportionment of 1901, seven congressmen). Electoral vote, nine.

Population.— The settlement of California, steadily progressive for 65 years, has been marked by two of the most remarkable shiftings of population anywhere recorded. Everything considered, the "Gold Rush" of 1848-49 has no parallel. In first 12 months after the discovery of a small flake of gold at Sutter's Mill, 42,000 Americans from the far Eastern States made their way across the unbroken plains with wagons. This great migration continued uninterruptedly for years. Its demands brought about the first large development of steam navigation; and the finest clipper ships that had ever been built were constructed for the California trade. In 1845 the white population of California was about 5,000; 4,000 of whom were Spanish Californians, 360 "Americans," 300 English, Scotch and Irish, and the remainder "scattering." By 1850 this number had increased to 92,597; by 1860 to 379,994. That is, in 12 years over 370,000 persons reached California by an overland journey of 2,000 miles; or by a voyage of 19,000 miles around the Horn in sailing ships; or by the 5,000 mile voyage by way of Panama, with its difficult passage of the isthmus. For the first decade this precipitate migration was overwhelmingly of men; and this preponderance of males, with dearth of families and of women, colored in almost every social, political and economic aspect the early fortunes of the State. The scarcity of home life, and profligate abundance of money, brought about an era of luxury in private and public expenditures on such a scale as was then hardly dreamed of in the Eastern States. San Francisco had less than 150,000 people when it began to build the largest hotel in the world — covering two and a half acres and costing $7,000,000. Everything was in this proportion. Enormous subscriptions were sent to relieve great catastrophes of fire, pestilence or war, in all parts of the world. Huge gifts were made to education and other public utilities, on a scale never yet surpassed and at that time elsewhere unheard of. For a generation San Francisco was a proverb the world over of princely living and princely giving. This large population of young men, vigorous, adventurous, mostly unattached, far from home and the conventions, and under excitation of sudden wealth, shaped and established such an epoch, social and financial, as no other American State has ever comparably known.

It was only after the first decline in the "diggings"— after the pursuit of gold became less a fortuitous scramble for surface nuggets, and mining had come to demand skill, patience, and business methods — that attention began to be paid to the soil. Though for 80 years the Franciscan missionaries had already proved, in little oases about their missions, the wonderful fertility of California, the aridity of climate and the "look" of the land, so unlike in color and texture to soils recognized as fertile at home, led the adventurers to believe for years that California was worthless except for mining and stock-raising. It was only when the real fecundity of the soil began to be understood that character of population underwent essential change. Immigration in the first decade was almost purely of male fortune-hunters, with no thought of permanent residence. They came to get rich and go home. But when the slow comprehension dawned that in agricultural possibilities the State was inconceivably richer than in mineral resources, and that here was not only the most hospitable of climates, but the most generous land for home-building, an entirely different type of migration began — the migration of families. This stream, small at first, has continued steadily since about 1870. In 1886 the completion of a competing railroad into southern California — to which its first transcontinental line had brought but slow increase of population or development — precipitated another migration numerically greater than the gold rush, almost as rapid, far longer continued and of entirely different category. It was characteristically of well-to-do and educated families, without the heroic qualities of the pioneers, but of much higher average in the civic and financial scale. They came not to tame a wilderness, but to enjoy such a land as travelers seek along the Mediterranean. They came by Pullman cars instead of "prairie schooner"; instead of felling forests they planted groves of tropical fruits; instead of building frontier cabins, they erected a class of homes such as probably cannot be found among an equal population. It is only by reference to the peculiar character of this migration that the development and progress of California in all social, educational and material lines during the last 25 years seems at all credible.

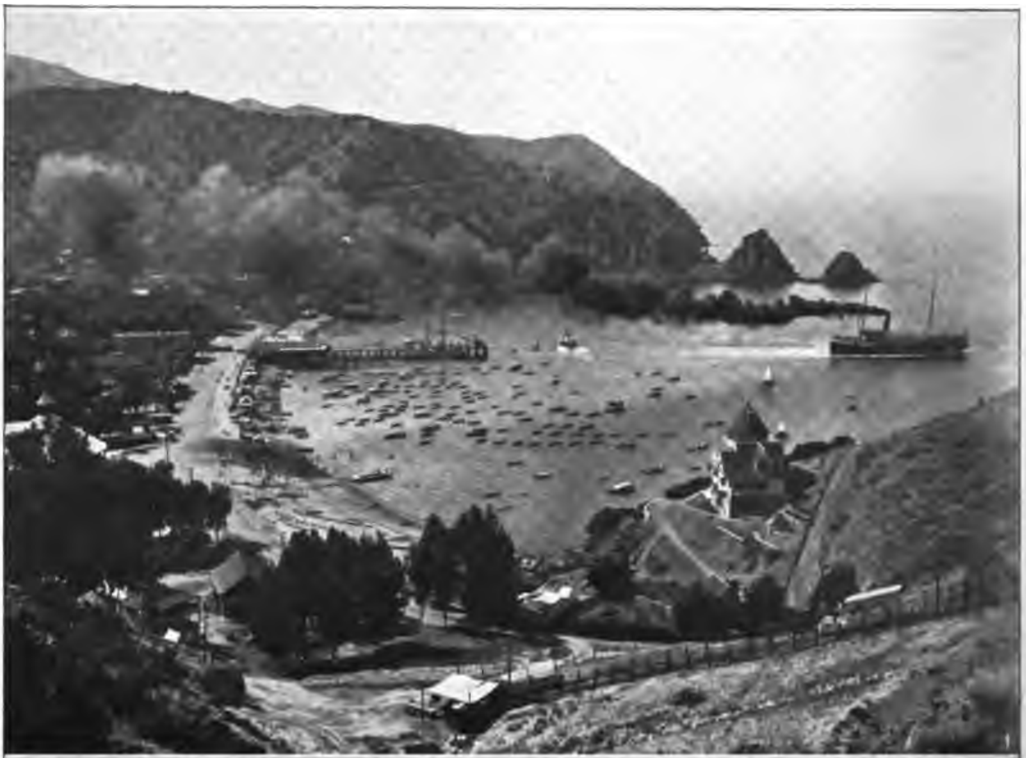
In 1880 the population was 864,694; in 1890, 1,208,130; in 1900, 1,485,053; in 1910, 2,377,549, an increase of 60.1 per cent since the census of 1900; in 1916 it was 2,938,654. The recent great increase in population, however, has been disproportionately in the seven southern counties of the State. Much more than half of the State gain for 20 years has been in eight counties, including in the northern half of the State only the city and county of San Francisco. Since 1880, Los Angeles had by 1910 outstripped in population 99 other American cities then numerically larger. In 1900 it was the 36th city in the Union in population, and only 13 cities in the Union had gained as many people in the decade. There are 58 counties, with 116 incorporated cities and towns; 50 places exceeding 5,000 popu-

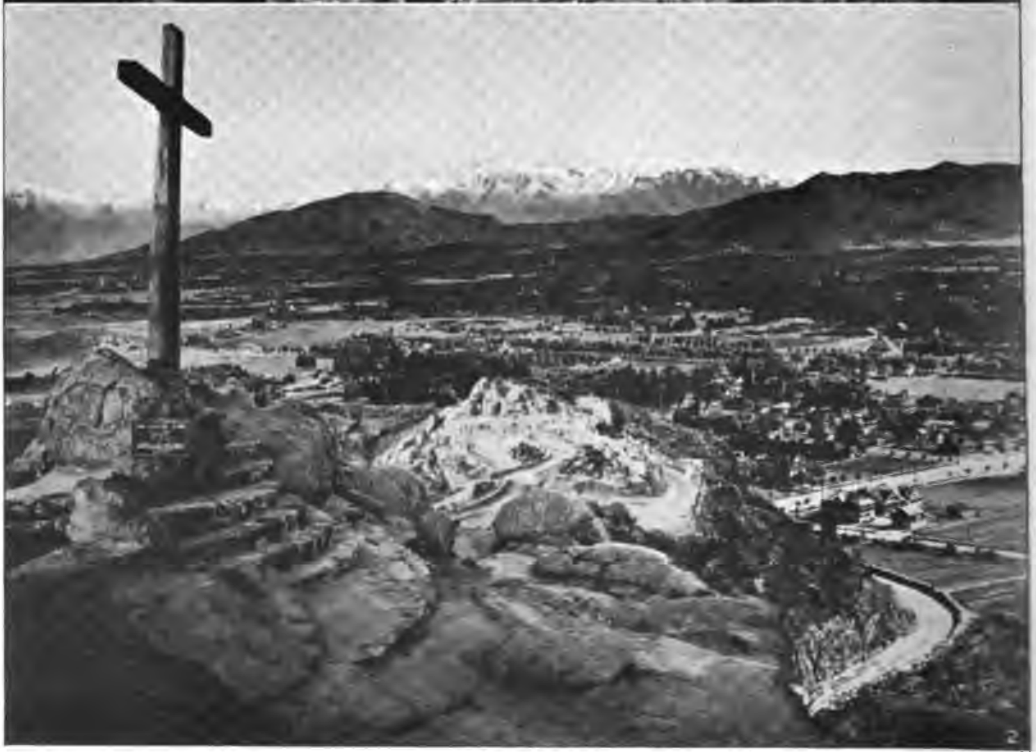




1 The Arroyo Seco ("Dry Wash"), a typical ravine between Los Angeles and Pasadena and its concrete bridge 1,460 feet long, 160 feet high
2 Oil wells in the Pacific Ocean at Summerland

CALIFORNIA





1 The Bay of Avalon, Santa Catalina Island
2 The Junipero Serra Cross on Mount Rubidoux; Riverside "the city of orange groves" 500 feet below; Snow-capped Mount San Bernardino (11,800 feet) in the distance

lation; 25 exceeding 10,000; and 12 exceeding 25,000. Of total population of 1,485,053 (1900), whites were 1,402,727; colored, 11,045; Chinese, 45,753; Japanese, 10,151; Indians, 15,377. The total males were 820,531; females, 664,522. Population has doubled in 1918; but these proportions are practically maintained. While in most of the far Eastern States the excess of females to males is increasing, in California the growth is steadily toward a balance. Of the total population, 1,117,813 were native born and 367,240 foreign.

The 15,377 Indians in California, comprising at least 14 different linguistic stocks, live principally on three reservations in the north, on 1 at Yuma, and 32 «mission» reservations, all on the edge of the desert in the south. They are mostly self-supporting, peaceful and fairly industrious farmers, with government day schools everywhere among them; besides which, 2,934 Indian children are in public schools. Their chief art is basket-making, in which some tribes lead the world for beauty and value of product. The record price for a basket is $2,000; but prices average from $5 to $50. The government is now encouraging this industry by teaching it in Indian schools.

Chief Cities.— For more than 60 years San Francisco was the largest city west of Saint Louis (about 2,000 miles by rail), and by far the largest on the entire Pacific Coast of North, Central and South America. Within a decade it has been outstripped by Los Angeles, which has now (1918) some 60,000 more population. San Francisco is still the foremost city of the whole Far West in business, commerce, bank clearings and shipping. From a population of 2,000 in February, 5,000 in July and 20,000 in December of 1849 (the first results of the gold rush), it had by the census of 1850 about 25,000; and has increased steadily since as shown by the appended table. The extraordinary growth of Los Angeles has come from New England and its pioneer migrations as northern New York, the «Western Reserve» of Ohio, northern Indiana, Illinois, Iowa, etc. At the annual picnic of the Iowa Societies (one for each county) held annually in Los Angeles County, there are more Iowa people present than the total population of any city in Iowa. The New England «State Societies» are also very large. In 1880 Los Angeles was the 135th city of the Union in population; in 1910 it was 12th in population, fifth in number of buildings erected, and eighth in value of new buildings; and first in expenditure per capita for new buildings. In 1918 it was about the eighth city in the Union in population. The first Federal census of California was in 1850. The following figures will show sufficiently the proportionate growth of the State and its leading cities:

	1850	1870	1890	1916
State	92,597	560,247	1,208,130	2,938,659
San Francisco	25,000	149,473	298,997	463,516
Los Angeles	1,610	5,728	50,395	503,812
Oakland	......	....	48,682	185,604
San Diego	......	....	16,159	90,330
Sacramento	......	....	26,386	75,000
Berkeley	......	....	5,101	60,000
Fresno	......	....	10,818	45,000
Pasadena	......	....	4,882	46,450
Stockton	......	....	4,124	42,000
Long Beach	......	....	564	32,252
Riverside	......	....	4,683	19,763
San José	......	....	18,060	34,000
Alameda	......	....	11,165	30,000
San Bernardino	......	....	4,012	18,000

The first large aviation field-meet in the United States was held in Los Angeles County about 1911. Until recently surpassed by a field in Texas, the North Island Field, San Diego was the largest in the country. Up to date, 1918, it has had the fewest fatalities, the climatic conditions making this location particularly adaptable for the training of beginners in aviation. Los Angeles is the world's chief centre of the «Moving Picture» industry; the expenditure within the city by the film industries amounting to about $20,000,000 a year, and the actors including nearly all the famous stage favorites. The fact that weather conditions are favorable nearly all the year is no more important than the fact that almost every landscape from that of Palestine or the Sahara to that of the Alps, from perpetual summer and roses to snowbanks and glaciers and deserts and almost every other geographic range can be duplicated within easy reach of the various studios, of which there are a large number. Egypt and Babylon and Switzerland, France, England and New England, South America — the pictures of these are almost entirely «located» in southern California. As with Florida, Switzerland and parts of New England, the tourist must be reckoned by the economist among the assets of the State. This is overwhelmingly the case in the southern counties, where the tourist influx amounts in value to from $75,000,000 to $100,000,000 per year. In 1915, over 250,000 tourists visited southern California. Unlike the case of other summer or winter resorts the number of tourists who remain permanently or return soon to become residents causes the increase in population which has no parallel in United States history. The climate, the scenery, the romance of the missions and other history, the educational and other advantages, the class of population already here, the growth of automobiling and the unrivalled facilities for this in southern California have conspired with other causes to make it the most visited State in the Union. Its permanent immigration is small from foreign countries except by individuals. Its great growth comes from the better classes of the Eastern States. From Point Concepcion on to San Diego (nearly half the total coast-line of the State) the littoral is dotted with dozens of cities, towns and resorts largely depending upon their interests of bathing, boating, fishing, yachting, etc. The most important of these, from north to south, are Santa Barbara, Ventura, Santa Monica, Venice, Ocean Park, Redondo, Long Beach, La Jolla and Coronado at San Diego. The important seaside towns have their enclosed swimming tanks; but many people take surf baths every month in the year. For climatic reasons above stated, the seaside above Point Concepcion is not as popular nor as populous for marine diversions, the water and the weather being alike too cool. Perhaps the most famous of these seaside resorts is the island of Catalina, about 20 miles off coast from the harbor of Los Angeles, with its placid bay and its remarkable «Marine Gardens» which are viewed through glass-bottom boats; and its fishing which is internationally famous. California is the paradise of the automobilist, and has more auto-vehicles per capita than any other part of the world. Within 10 years (ending with 1917) over $40,000,000 have been spent by State and counties on «good roads»— of native asphalt and gravel, largely founded on concrete, and generally smooth as a table. One can ride almost from end to end of the State on these luxurious roads — and over 1,000 miles in Los Angeles County alone. There are many extraordinary scenic drives — some over a mile above the sea. This has naturally led to the decimation of deer, duck, rabbits, quail and trout, as well as the multiplication of cars. There were in 1917 over 400,000 auto-vehicles in the State — about two-thirds in the southern half. Southern California has also the largest per capita number of telephones in the world. The automatic telephone was perfected here. The number of telephones in California, 1 Jan. 1918, was 669,470, being one telephone to every 4.38 persons; for San Francisco, 130,175, being one to every 3.56 persons; for Los Angeles, 132,662, being one telephone to every 3.79 persons. Comparison is often more graphic and more instructive than mere figures. California has a total area practically equal to that of Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York and Pennsylvania combined; or England, Ireland, Scotland, Wales, Barbados, Mauritius, Straits Settlements, Cyprus and Hongkong together; or our Philippines, Hawaii, Porto Rico, Samoa and Guam, with Massachusetts and Connecticut thrown in. California has in its 18 «National Forests» more acres of great trees than the total area of the States of New Hampshire, Massachusetts, Connecticut, Rhode Island and Delaware — and nearly another Delaware thrown in; and the national reserves are less than half the forestation of the State. California has enough primal desert to blanket most of New England. But in that same desert is more mineral production per annum (except coal and oil) than is recorded for all States east of the Alleghanies in all their history.

California's hay, grain and alfalfa fields are nearly as large in area as the States of Connecticut and Delaware. California's fruit farms cover more than twice the area of Rhode Island; and California's acreage to vegetables another Rhode Island. Nor do these figures for vegetables include half another Rhode Island in cultivated home-lots. California's acreage in beans, sugar, beets and potatoes is 15 per cent larger than Rhode Island.

History.— The name California, for which so many preposterous derivations have been urged, is taken from a Spanish romance, called 'Sergas de Esplandian' ('Exploits of Esplandian') by Ordoñez de Montalvo (translator of 'Amadis de Gaul'), printed about 1510, and often mentioned in old sources. «California» was a mythical island «on the right hand of the Indies, very near the Terrestrial Paradise,» peopled with Amazons and Griffins. The name was first applied to the peninsula (discovered by Jimenez 1533) and is first recorded thus in Preciado's diary of Ulloa's coastwise voyage in 1539. In time it came to be used indefinitely for the whole Pacific Coast from the peninsula practically to Nootka; and later «the Californias,» differentiated into Baja (or Lower) California and Alta (Upper) California, the former including about what is now the Mexican Peninsular Territory. The first European to touch the present State was Alarcon, who went up the Colorado River some hundreds of miles in 1540. The first seaboard exploration was by Cabrillo 1542; and the next important coast explorations were by Sir Francis Drake 1579, and Vizcaino 1602. The first colonization of Upper California was in 1759 by the Franciscan missionaries under Junipero Serra, with a small escort of Spanish troops. These pioneer missionaries had by 1800 founded 18 missions, whose total population, mostly Indian neophytes, was 13,000. Three other missions were established by 1823. The mission period lasted about 65 years; converted over 80,000 Indians; erected in the wilderness at least $1,000,000 worth of buildings, and had developed stock-raising and wheat on a scale which astonished Humboldt. In 1834 the Mexican government «disestablished» the missions and confiscated their property. The Indians were scattered, and perished in great numbers. The buildings were plundered and left to decay. At present the Landmarks Club (incorporated) is preserving the mission edifices. The State passed from Spanish rule to that of the Mexican republic, 1821; was seized, practically without resistance, by the United States in 1845, and ceded by Mexico at close of Mexican War; admitted to the Union, 9 Sept. 1850. The American discovery of gold caused an unprecedented trans-continental migration (see *Population*). Aside from the great impetus given steam and clipper ships, the migration had other unique features — like the Merchants' Express, which employed 5,000 men, 2,000 wagons and 20,000 yoke of oxen in freighting across the continent; and the Pony Express, which carried mail (letters only) at $5 per half ounce, 1,950 miles horseback from Independence, Mo., to San Francisco, in 10 days; and the Butterfield stages, 8 times a month between Saint Louis and San Francisco, via Texas and New Mexico; quickest time, 21 days from New York to San Francisco. Extraordinary records were made in this overland traffic. Robert H. Haslam («Pony Bob») made one continuous ride of 380 miles; and William F. Cody («Buffalo Bill») one of 384, without stopping except for meals and to change horses — both as riders of the Pony Express. The quickest time made by this route (1,950 miles), was 7 days, 17 hours. The growth of this overland traffic led California capitalists, heavily subsidized by government, to build a transcontinental railroad. Ground was broken at Sacramento for the Central Pacific Railroad 8 Jan. 1863. The road was completed by driving of a spike of pure California gold by Governor Stanford in the presence of distinguished company at Promontory, Utah, 10 May 1869. In 1877 the Southern Pacific Railroad from Texas tidewater to San Francisco was completed. In 1885 the Atchison, Topeka and Santa Fé Railroad reached Los Angeles from Saint Louis; and in about 1910 was extended to San Francisco. The latter and the Southern Pacific Railroad are among the longest railroad systems in the world, the former with a mileage of 8,648 and the latter with a mileage of 7,065. The modern development of California dates from competition of these two lines during the decade beginning 1886.

The swift creation of an American commonwealth by the sudden horde of adventurous pioneers upon whom that duty at once devolved

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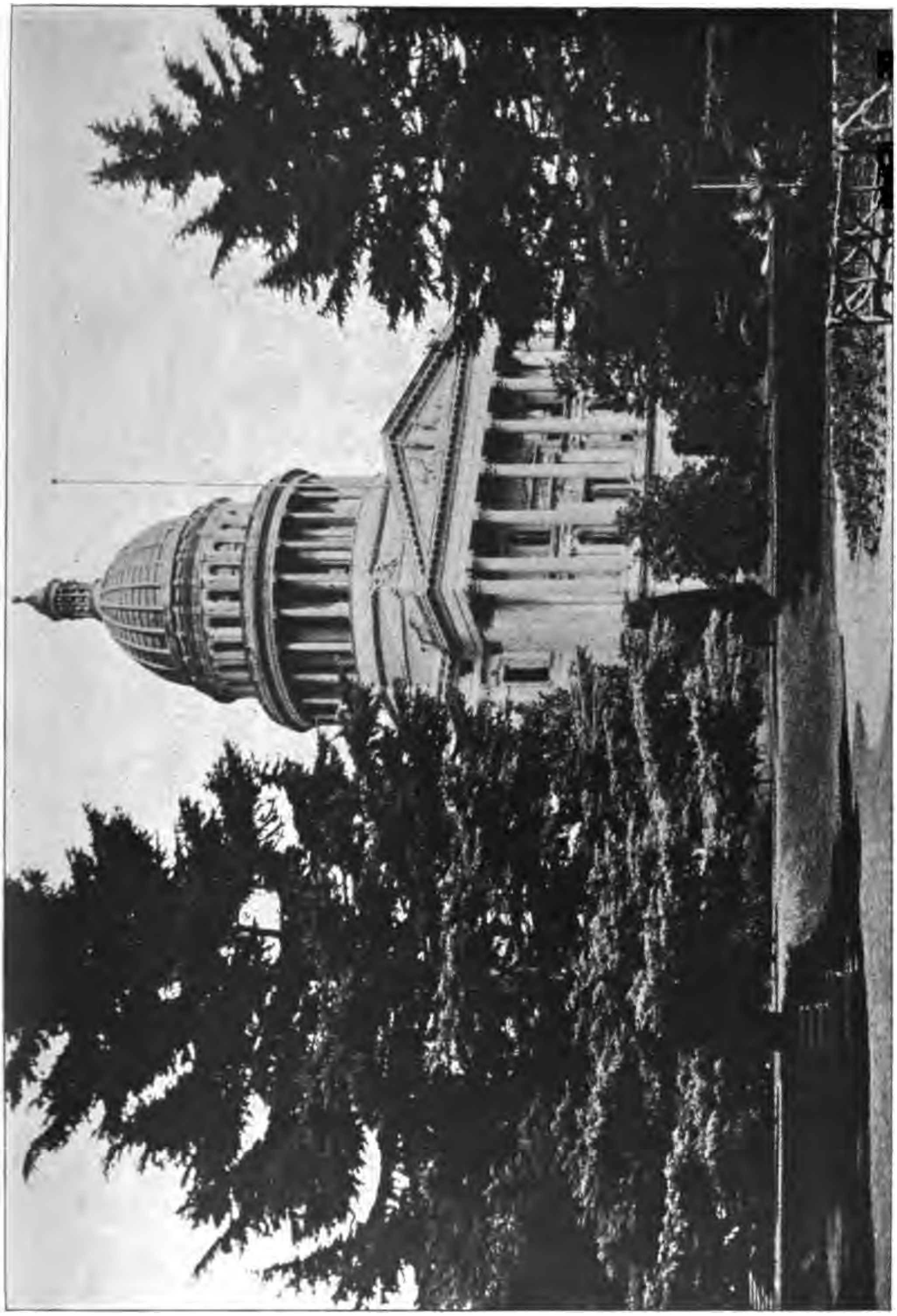

Photograph by Southern Pacific Co.

State Capitol at Sacramento, Cal.

is perhaps the most remarkable monument to the genius of the American people for self-government. Ninety thousand wanderers, homeless, wifeless and chaotic in the wilderness, fevered by enormous and sudden gains, without cities or laws or communication with the outside world, within a year installed soberly and firmly all essential machineries of an American State. The desperadoes who flocked in from all parts of the world — including a large contingent of Australian convicts — were firmly suppressed, though not at once. Between 1849 and 1856 there were in San Francisco alone 1,000 homicides and seven executions. In 1856 the second vigilance committee, composed of the best citizens, after full and formal trial, publicly hanged half a dozen of the worst desperadoes, and banished scores of others on pain of death. Since that time life and property have been quite as safe in California as in the Eastern States. Chinese exclusion, though finally a national measure, was brought about by California, which then contained a majority of all Chinese in this country. In 1879 California voted exclusion by 154,638 to 883. The number of Chinese in the State has decreased from 75,132 in 1880 and 72,472 in 1890 to 45,753 in 1900. The bitterness aroused by the exclusion struggle has passed, and Chinese are well treated.

California entered the Union as a free State, thus giving balance of power to the North. In State elections since the war it has been peculiarly independent, having gone Democratic in 1867, 1875, 1882, 1886 (Democratic governor and Republican lieutenant-governor, who became governor by his superior's death) and 1894; Republican in 1871, 1879, 1890, 1898 and 1902.

In politics, California is counted «Safe Republican.» For its first half century it came near alternating between the two great parties; but from 1902 to 1918 has elected only Republican governors (including a «Progressive»). In national politics it has given its electoral vote in the same 16 years for only one Democratic President — Wilson, second term. This was largely by the women's vote, and on the slogan «He kept us out of war.» The presidential vote of California was decisive. California was the sixth State to adopt (1911) equal suffrage, and the first State of considerable size — being more than double the total population of the five earlier equal suffrage States. In 1916, out of a population of 3,000,000, the total registration was 1,314,446; the total vote nearly 80 per cent of this, ranging from 39 per cent to 46 per cent women. No woman has been elected to a Federal or State office; about 30 have been appointed. In counties and cities, over 50 women have been elected to office — from 18 superintendents of schools, to one county clerk and the only councilwoman in the county (Los Angeles). There are several policewomen, probation officers, etc.; and many serving on civic commissions. The question of their eligibility on juries is not yet (1918) determined, and depends on the ruling of the judge. Women have procured the introduction and enactment of over a dozen humanitarian laws of varying importance and value, chiefly concerned with women and children, prohibition and «the social evil.»

Next to the gold excitement (see *Mining* and *Population*) the most sensational era in California history was the great bonanza silver period from 1859 to 1880. The mines were in Nevada, but were owned in San Francisco, and an era of stock-gambling theretofore unheard of in history, and probably not yet surpassed, sprang from their sensational yield. Stocks on the San Francisco board rose $1,000,000 a day for many months, and sales in one year were $120,000,000. Everybody gambled in stock, from bankers to scrubwomen. In 1875, with less than 200,000 population, San Francisco had 100 millionaires. The «Consolidated Virginia» mines paid $1,000,000 per month dividends for nearly two years. One lode was valued at nearly $400,000,000; $250,000,000 was spent in «developing» a small group of hills. The decadence of these great bonanzas, following the subsidence of gold mining to sober methods, at last turned more general attention to agriculture, the real wealth of the State. (See *Agriculture*). In 1880 California was first in the Union only in gold, sheep and quicksilver; all other industries being far down the list. It is now first in gold; ninth in sheep; first in diversity of crops; first in wines, total fruits, canned fruits, dried fruits, barley; first in number of irrigated farms; first in average wages in manufacturing establishments; first in borax, asphalt, quicksilver, platinum; second in copper; third in wheat; first in beet sugar; first in hops; first in oranges, lemons, olives and all semi-tropic fruits, honey, prunes, walnuts, almonds, beans, grapes, pears, peaches, cherries, apricots, etc.; first in electric power transmission; third in ship-building; second in petroleum; fifth in total value products per farm; eleventh in value of farm products per capita; twelfth in total value of manufactured products.

The highest California gold product in any one year was $85,000,000. The total agricultural products for 1916 were $194,566,000; and total value of manufactured products (1916) $712,800,764.

A South Sea bubble as wild as the Comstock silver stock-craze was the great «Land Boom» of southern California, 1886-87, a period of land-gambling never quite equaled in any other part of America. An area as large as New England was involved, with varying intensity; but the chief focus of excitement was in Los Angeles, San Bernardino and San Diego counties. Scores of thousands of city lots were staked out far from towns; hundreds of miles of cement sidewalks and curbs were laid; scores of big hotels and other buildings erected as baits, and great quantities of lands (purchased at from $10 to $30 per acre) were sold in town lots at $1,000 to $10,000 per acre. In Los Angeles County alone, with a population then not over 50,000, real estate transfers recorded in 1887 were over $100,000,000. Excursion auction sales of new «towns» sometimes realized $250,000 in a day; and $100 was often paid for place in the line waiting for a sale to open. The collapse of this gigantic bubble, early in 1888, was as extraordinary in its freedom from disaster as it had been in its inflation. Not a bank failed, nor a business house of respectable standing; and while desert town lots reverted to acreage and acreage values, all really desirable real estate, rural and urban, has constantly advanced in value every year — thanks to the uninterrupted continuance of large and wealthy immigration. Building of homes and setting out of orchards continue on an extraordinary scale. «Local option» is in force; and nearly all towns of southern California are «prohibition.»

MILITARY AND PROVISIONAL GOVERNORS.

Com. John D. Sloat	1846
Col. Robert F. Stockton	1846–47
Col. John C. Fremont	1847
Gen. Stephen W. Kearny	1847
Col. R. B. Mason	1847–49
Gen. Persifor F. Smith	1849
Gen. Bennet Riley	1849

STATE GOVERNORS.

Peter H. Burnett	Democrat	1849–51
John H. McDougall	"	1851–52
John Bigler	"	1852–56
John N. Johnson	Know-Nothing	1856–58
John B. Weller	Democrat	1858–60
Milton S. Latham	"	1860
John G. Downey	"	1860–61
Leland Stanford	Republican	1861–63
Frederick F. Low	"	1863–67
Henry H. Haight	Democrat	1867–71
Newton Booth	Republican	1871–75
Romualdo Pacheco	"	1875
William Irwin	Democrat	1875–79
George G. Perkins	Republican	1879–83
George Stoneman	Democrat	1883–87
Washington Bartlett	"	1887–
Robert W. Waterman	Republican	1887–91
Henry H. Markham	"	1891–95
James H. Budd	Democrat	1895–99
Henry T. Gage	Republican	1899–1903
George C. Pardee	"	1903–07
James N. Gillett	"	1907–10
Hiram W. Johnson	Progressive	1910–

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Charles Fletcher Lummis,
Founder Emeritus, The Southwest Museum,
Founder and President, Landmarks Club.

CALIFORNIA, Gulf of, or **SEA OF CORTEZ,** an arm of the Pacific Ocean, separating Lower California from the Mexican mainland. It is 700 miles in length, varies in width from 40 to 100 miles, and has a depth ranging from 600 feet near the head to over 6,000 feet near the mouth, containing many islands in the upper part. There is but little navigation carried on there. On the western coast are pearl fisheries. The gulf was discovered by Cortez, and for some time was called after him. The river Colorado empties into the northern extremity.

CALIFORNIA, Lower or **Old,** a territory of the republic of Mexico, forming a peninsula in the Pacific Ocean, united on the north to the continent, from which it is separated on the east, throughout its entire length, by the Gulf of California. It extends from about lat. 22° 40′ to 32° 40′ N. It is about 750 miles in length, and in different places 30, 60, 90 and 150 miles wide. The coast forms many capes, bays and havens, and is fringed by numerous islands. A chain of mountains extends throughout, of which the greatest height is from 4,500 to 4,900 feet above the sea, the latter being the height attained by its culminating point, Cerro de la Giganta. The chain is almost destitute of vegetation, having only here and there a few stunted trees or shrubs. It has a single volcano, and possesses distinct traces of volcanic origin. The foot of the range is covered with cactuses of remarkable size. Some of the hollows, where the soil is formed of decomposed lava, are tolerably fertile. On the plains the soil is often of the richest quality, and when the advantage of irrigation can be obtained, raises the most abundant crops; but this advantage often fails, owing to the great deficiency of water. Rain seldom falls in summer, in most of the region ranging from under 10 to 25 inches, and the streams are very insignificant. The climate varies much according to locality. On the coast of the Pacific the temperature ranges in summer from 58° to 71°. At a distance from the coast, where the sea breeze is not enjoyed, the summer heat is excessive. The principal food products are maize, manioc wheat, grapes, oranges, lemons, pineapples and other choice fruits; cattle raising, fishing, gold mining and pearl fishing are also successfully carried on. La Paz, in the south, is the capital; Ensenada, in the north, is a rising port. Lower California was explored by order of Cortez in 1532-33, and was visited by Drake as early as 1579. In 1697 the Jesuits formed establishments in the territory, built villages and missions, and in some measure civilized the natives. On their expulsion in 1767, the missions were carried on by the Dominicans. Pop. about 52,244, of whom probably about half are Indians.

CALIFORNIA, Pa., borough in Washington County on the Monongahela River, 50 miles south of Pittsburgh, on the P., V. and C. Railroad. The largest coal mine in the world is located here (Vesta No. 4). There are also manufactures of glass bottles and foundry and machine shops. The resources of the two banks amount to $1,735,045. The Southwestern State Normal Schools and the borough public and high school are situated here. The latter and the borough building are fine structures. The government is in the hands of a council of seven members. Pop. about 2,500.

CALIFORNIA, University of, a university which is a part of the State educational system in California, but supported as well by the income from endowments and by national aid.

In 1869 the College of California, which had been incorporated in 1855 and which had carried on collegiate instruction since 1860, closed its work of instruction and transferred its property, on terms which were mutually agreed upon, to the University of California.

The university was instituted by a law which received the approval of the governor, 23 March 1868. Instruction was begun in Oakland in the autumn of 1869. The commencement exercises of 1873 were held at Berkeley, 16 July, when the university was formally transferred to its permanent home. Instruction began at Berkeley in the autumn of 1873. The new constitution of 1879 made the existing organization of the university perpetual.

The professional schools were contemplated in the original plan, but not organized till later. The governing body, the board of regents, consists of the governor and lieutenant-governor of the State, the speaker of the assembly, the State superintendent of public instruction, the presidents of the State Agricultural Society and the Mechanics' Institute of San Francisco, and the president of the university (all regents ex officio), and 16 others appointed by the governor for a 16-vear term with the advice and consent of the senate. The uni.ersity comprises the following colleges and departments: (1) In Berkeley: the colleges of letters and science, commerce, agriculture (courses at Berkeley; farms and laboratories, etc., at Davis, Riverside, Whittier, Chico, Santa Monica, Tulare County, Meloland and Kearney Park, Fresno County), mechanics, mining, civil engineering, chemistry; the schools of architecture, education, jurisprudence, medicine (first year and part of second year), the university extension division, the California Museum of Vertebrate Zoology; (2) at Mount Hamilton: the Lick Astronomical Department (Lick Observatory); (3) at Santiago, Chile: the D. O. Mills Observatory; (4) in San Francisco: the California School of Fine Arts, the Hastings College of Law, the medical school (part of second year, and the third, fourth and fifth years, including the University Hospital, the George Wililams Hooper Foundation for Medical Research, the college of dentistry, the California college of pharmacy, the museum of anthropology, archæology and art; (5) in Los Angeles: Los Angeles Medical Department (graduate instruction only); (6) the Scripps Institution for Biological Research at La Jolla; (7) the Herzstein Research Laboratory of Biology at Pacific Grove, and (8) the Summer School of Surveying at Swanton.

In 1896 Mrs. Phœbe Apperson Hearst informed the regents that she proposed to erect a building, but wished first a worthy general plan for the Berkeley campus, and that she would bear the expense of an international competition to obtain such a plan. In 1898 an international jury assembled at Antwerp and voted upon more than 100 plans submitted, awarding prizes to 11 competitors, who were invited to visit the university and to prepare revised plans for a second competition. In September 1899, the jury met again in San Francisco and gave the first prize ($10,000) to M. Emile Bénard of Paris. After a long stay in Berkeley and many conferences with the university authorities, M. Bénard undertook a revision of his drawings to fit the plans to the actual necessities of the site and the prospective needs of the university. In December 1909, he submitted a design which the regents adopted as the permanent plan. To Mr. John Galen Howard was entrusted the development of the plan, as supervising architect. In realization of the Hearst plan, several buildings have been completed including the Hearst Memorial Mining Building, given by Mrs. Hearst for the college of mining of the university and as a memorial to the late Senator George Hearst; California Hall, for which an appropriation of $250,000 was made by the California legislature, and the president's house. Another notable building is the beautiful Greek theatre, an open-air auditorium, seating 8,000, patterned after the classic theatres of Greece and the Greek colonies, and given to the university by Mr. William Randolph Hearst. Among other new buildings is the library, for which generous provision was made by Mr. Charles F. Doe of San Francisco, who bequeathed $700,000 for this purpose.

Since this time gifts and appropriations have made possible the erection of a series of new buildings. As a memorial to her husband, the late Judge John H. Boalt, Mrs. Elizabeth J. Boalt in 1908 made a gift of about $100,000 to the university for the erection of a Hall of Law. Members of the bench and bar of California subscribed an additional $50,000 and on the 28th of April, 1911, the Boalt Hall of Law, constructed of white granite and completely equipped with library, offices and class rooms, was formally dedicated. Upon the death of Mrs. Jane K. Sather on 12 Dec. 1911, President Wheeler, as her trustee, sold to the regents of the university property valued at $400,000 which Mrs. Sather had left as a gift to the university. Of this sum $200,000 was devoted to the erection of the Sather Tower, a white granite campanile 302 feet in height, designed after several similar towers in Italy, but not a direct replica of any one. In 1917 the Sather Bells, made in Europe at a cost of $10,000, were hung in the Sather Tower and the Sather Esplanade was constructed at its base at a cost of $40,000. Benjamin Ide Wheeler Hall, the new classroom building, was made ready for occupancy in January 1917. It was built at a cost of $720,000, of white granite, and represents the Georgian tradition in architecture. It contains an auditorium seating 1,020 people, 62 classrooms, 48 studies for members of the faculty (each study accommodating two), a large and comfortable faculty room, and accommodations for 4,889 students at one time. Hilgard Hall, the new agriculture building, was dedicated in the summer of 1917. It was built of reinforced concrete at a cost of $362,000, to house instruction in agronomy, citriculture, forestry, genetics, pomology, soil technology and viticulture. The exterior of this building is notable for the highly original treatment of decoration in sgraffiti — the use of colored cements for adornment of concrete surfaces. Work was started in 1917 on Gilman Hall, which is being built at a cost of $220,000, to house the research laboratories in chemistry. It will be used by the faculty and by graduate students. Reinforced concrete is the building material used. These three buildings were designed by John Galen Howard, professor of architecture and supervising architect in the university. Under his direction also has been completed the university library, at a cost of about half a million dollars, making the total cost of the building $1,400,000. Special features of the new portion are a second reading room seating 240 readers and used for periodicals (of which the university receives 8,000 titles), 20 seminar rooms, 22 faculty studies and space for bookstacks to hold 1,250,000 volumes, although at present this space is only utilized for some 600,000 volumes. In San Francisco the university has built the university hospital at a cost of $700,000, with accommodations for 225 patients. It is mainly intended as a laboratory for the university's medical school and the Hooper Foundation for Medical Research.

The university has 542 officers of instruction, 5,850 students, a library of 360,000 volumes, an art gallery, museums and laboratories, also the agricultural experiment grounds and stations, which are invaluable adjuncts of the farming, orchard and vineyard interests of the State. In San Francisco there are 150 officers of instruction, besides demonstrators and other assistants, and 775 students. Tuition in the colleges at Berkeley, during regular sessions, is free to residents of California; non-residents pay a fee of $10 each half year. In the professional colleges, in San Francisco, except that of law, tuition fees are charged. The instruction in all the colleges is open to all qualified persons, without distinction of sex. The constitution of the State provides for the perpetuation of the university with all its departments.

In 1917 there were 5,850 students in all the departments, of whom about 60 per cent, due to the entrance of the United States into the war, were women; it is also to be noted that a comparatively large proportion of students is in the general or academic courses, as distinguished from the technical and professional courses.

CALIGULA, Gaius Cæsar Augustus Germanicus, Roman Emperor, a son of Germanicus and Agrippina: b. 31 Aug. 12 A.D., in the camp at Antium, and brought up among the legions; d. 24 Jan. 41 A.D. He received from soldiers the surname of Caligula, on account of his wearing the *caligæ,* the boots commonly used by the soldiers. He understood so well how to insinuate himself into the good graces of Tiberius that he not only escaped the cruel fate of his parents, and brothers, and sisters, but was even loaded with honors. Whether, as some writers inform us, he removed Tiberius out of the way by slow poison is uncertain. When the latter was about to die he appointed, according to Suetonius, Caligula and the son of Drusus, Tiberius Nero, heirs of the empire. But Caligula, universally beloved for the sake of his father, Germanicus, was able without difficulty to obtain sole possession of the throne. Rome received him joyfully, and the distant provinces echoed his welcome. His first actions were just and noble. He interred, in the most honorable manner, the remains of his mother and of his brother Nero, set free all state prisoners, recalled the banished and forbade all prosecutions for treason. He conferred on the magistrates free and independent power. Although the will of Tiberius had been declared by the Senate to be null and void, he fulfilled every article of it, with the exception only of that above mentioned. When he was chosen consul he took his uncle, Claudius, as his colleague. Thus he distinguished the first eight months of his reign by many magnanimous actions, when he fell sick. After his recovery, by a most unexpected alteration, which has given good grounds to suspect his sanity, he suddenly showed himself the most cruel and unnatural of tyrants. The most exquisite tortures served him for enjoyment. During his meals he caused criminals, and even innocent persons, to be stretched on the rack and beheaded; the most respectable persons were daily executed. In the madness of his arrogance he even considered himself a god, and caused the honors to be paid to him which were paid to Apollo, to Mars, and even to Jupiter. He also showed himself in public with the attributes of Venus and of other goddesses. He built a temple to his own divinity. At one time he wished that the whole Roman people had but one head, that he might be able to cut it off at one blow. He frequently repeated the words of an old poet, *Oderint dum metuant* — «let them hate so long as they fear.» He squandered the public money with almost incredible prodigality. One of his greatest follies was the building of a bridge between Balæ and Puteoli (Puzzuoli), in order that he might be able to boast of marching over the sea on dry land. He had it covered with earth, and houses built on it, and then rode over it in triumph. He gave a banquet in the middle of the bridge, and to celebrate this great achievement ordered numbers of the spectators whom he had invited to be thrown into the sea. On his return, he entered Rome in triumph, because, as he said, he had conquered nature herself. After this, he made preparations for an expedition against the Germans, passed with more than 200,000 men over the Rhine, but returned after he had traveled a few miles, and that without having seen an enemy. Such was his terror, that, when he came to the river, and found the bridge obstructed by the crowd upon it, he caused himself to be passed over the heads of the soldiers. He then went to Gaul, which he plundered with unexampled rapacity. Not content with the considerable booty thus obtained, he sold all the property of both his sisters, Agrippina and Livilla, whom he banished. He also sold the furniture of the old court, the clothes of Marcus Antonius, of Augustus, Agrippina, etc. Before he left Gaul, he declared his intention of going to Britain. He collected his army on the coast, embarked in a magnificent galley, but returned when he had hardly left the land, drew up his forces, ordered the signal for battle to be sounded, and commanded the soldiers to fill their pockets and helmets with shells, while he cried out, "This booty, ravished from the sea, is fit for my palace and the capitol!" When he returned to Rome, he was desirous of a triumph on account of his achievements. but contented himself with an ovation. Discontented with the Senate, he resolved to destroy the greater part of the members, and the most distinguished men of Rome. This is proved by two books which were found after his death, wherein the names of the proscribed were noted down, and of which one was entitled *Gladius* (Sword), and the other *Pugillus* (Dagger). He became reconciled to the Senate again when he found it worthy of him. Caligula's morals were, from his youth upward, corrupt. After he had married and repudiated several wives, Cæsonia retained a permanent hold on his affections. A number of conspirators, at the head of whom were Chærea and Cornelius Sabinus, both tribunes of the prætorian cohorts, murdered him in the 29th year of his age, and the fourth of his tyrannical reign, which thus lasted from 37 to 41 A.D. Consult Baring-Gould, 'The Tragedy of the Cæsars' (London 1892).

CALIPH (Fr. *calife*, Ar. *khalīfa*, calif, successor), is the name assumed by the successors of Mohammed in the government of the faithful and in the high-priesthood. Caliphate is therefore the name given by historians to the empire of these princes which the Arabs founded in Asia, and impelled by religious enthusiasm, enlarged, within a few centuries, to a dominion superior in extent to the Roman empire. The title is still borne by the Sultan of Turkey. Mohammed, in the character of the prophet of God, made himself the spiritual and temporal ruler of his people. In the following account the dates both of the Hegira and the Christian year are often given. The difference in the mode of computing the Mohammedan year has caused considerable divergencies among authorities in regard to the exact dates of the particular events of Mohammedan history.

After the death of the Prophet the election of a successor occasioned considerable excitement, Mohammed having left no son and nominated no successor. Abdallah Ebn Abu Koafas, called Abubekr, that is, father of the virgin (because his daughter Ayesha was the only one of the wives of Mohammed whom he had married as a virgin), obtained the victory over Ali, the cousin and son-in-law of Mohammed, and became the first caliph, 632 A.D. (year of the Hegira 11). Victorious over enemies at home, by the aid of his general, Khaled, "the Sword of God," he proceeded, as the Koran directs, to spread the doctrines of Mohammed by arms among the neighboring nations. With the watchword, conversion or tribute, a numerous army, consisting entirely of volunteers inspired with zeal for the holy war, penetrated into Syria and Mesopotamia, but before much could be done, Abubekr died after he had filled the place of the Prophet two years and four months.

Omar, another father-in-law of the Prophet, now became second caliph, and under him the war was continued. The Moslems having once acquired a strong footing in Syria by the treacherous surrender of Bosra, they undertook, under Khaled, the siege of Damascus, and having repulsed two large armies, sent by the Emperor Heraclius to the relief of the city, they obtained possession of it by a capitulation (635 A.D.), the terms of which were perfidiously broken, Khaled pursuing and slaughtering the retreating Christians. By him and other generals, though not without a brave resistance on the part of the Greeks, the subjugation of Syria was completed (638 A.D., of the Hegira 17). Jerusalem having been compelled to surrender (636 A.D., Heg. 15), Omar proceeded thither in person to fix the terms of capitulation, which subsequently served as a model in settling the relations of the Moslems to the subject Christians. These terms were carefully observed by the conscientious caliph. The new Persian empire of the Sassanidæ was also overthrown, and Mesopotamia and other extensive regions overrun. Equally successful was the Mohammedan general, Amru, in Egypt, which was subjected to the caliphate in two years (641). Omar was the first who bore the appellation of Emir al Moumenin ("Prince of the Faithful") — a title inherited by all succeeding caliphs. Many of these conquests were over Christian populations who readily changed their creed and adapted themselves to the new rule.

After the murder of Omar by a revengeful slave (644 A.D., Heg. 23), a council, appointed by him on his death-bed, chose Osman, or Othman, son-in-law of the Prophet, passing over Ali. Under him the empire of the Arabs continued to expand. From Egypt the tide of conquest advanced westward along the northern coast of Africa, as far as Ceuta. Cyrus too (647 A.D.), and Rhodes (654 A.D.) were conquered; but the former was lost again two years after. An agitation against Othman now arose, partly owing to the fact that he favored and aggrandized his own family connections in every way, and entrusted the provinces, not to the most capable, but to his favorites. To many also the claims of Ali to the caliphate were deemed superior to those of Othman. The dissatisfaction thus excited occasioned a general insurrection in the year 656 (Heg. 34), which terminated in Othman's death.

Ali, the son-in-law of the Prophet by Fatima, became the fourth caliph, by the choice of the people of Medina, and is regarded as the first legitimate possessor of the dignity by a numerous sect of Mohammedans, which gives him and his son, Hassan, almost equal honor with the Prophet. This belief prevails among the Persians, and others who belong to the Shiite sect as opposed to the Sunnites or Orthodox. Instead of being able to continue the conquests of his predecessors, Ali always had to contend with domestic enemies. Among these was Ayesha, the widow of the Prophet, called the mother of the faithful; also Tellah, Zobeir, and especially the powerful Moawiyah, governor of Syria, who all laid claim to the government. These were able to create suspicion, and spread the report that Ali had instigated the murder of Othman. In vain did he endeavor to repress the machinations of his enemies by entrusting the government of the provinces to his friends. Nowhere were the new governors received. The discontented collected an army and made themselves masters of Bassora. Ali defeated it, and Tellah and Zobeir fell; but he could not prevent Moawiyah and his friend Amru from extending their party and maintaining themselves in Syria, Egypt, and even in a part of Arabia. Three men of the sect of the Kharejites proposed to restore concord among the faithful, by slaying each one of the three heads of the parties, Ali, Moawiyah and Amru; but Ali only fell (661 A.D., Heg. 40). He was a man of a cultivated mind, and was the author of a collection of sentences or moral maxims, etc. His son, the mild, peaceful Hassan, had no desire to defend the caliphate against the indefatigable Moawiyah; a treaty was concluded between the two, by which Hassan solemnly abdicated the government (661). Some years later he perished by poison, said to have been administered by one of his wives at the instigation of Moawiyah.

Moawiyah I transferred the seat of the caliphate from the city of the Prophet, Medina, where it had hitherto always been, to Damascus, in the province of which he had formerly been governor (673 A.D., Heg. 54). With him began the series of the caliphs called Ommiades (or Ommayads), which name this family bore from Moawiyah's progenitor, Ommiyah. Not long after his accession he was obliged to quell an insurrection of the Kharejites by a campaign, and a rebellion at Bassora by severe punishments. He then seriously meditated the entire subversion of the Byzantine empire (q.v.). Rhodes was attacked, and the famous colossus was broken in pieces. His son Jezid marched through Asia Minor, meeting but little resistance; then crossed the Hellespont and laid siege to Constantinople, but was obliged to raise it (669 A.D., Heg. 49). Other generals were more successful against the Turks in Khorasan, and the regions extending to the borders of India.

The next caliph, Jezid (or Yazid), was not altogether a worthy successor of his father, the politic Moawiyah (680 A.D., Heg. 60). At first he was not acknowledged by the two holy cities, Mecca and Medina, which, as long as the caliphs had resided in the latter city, had enjoyed a principal voice in their election, but which had not been consulted when Moawiyah, according to the custom of the caliphs, appointed his successor in his lifetime. The discontented espoused the cause, either of Houssain, the famous son of Ali, or of Abdallah, Zobeir's son, both of whom had laid claim to the caliphate. A rebellion of the inhabitants of Irak, in favor of Houssain, led by Moslim, Houssain's cousin, was suppressed by the prudence and decision of Obeidallah, governor of Cufa; and Houssain, who had accepted the invitation of the conspirators, was killed (680 A.D., Heg. 61), to the great grief and rage of all those who took part with Ali's family — a feeling still cherished by the Shiites. Abdallah Ebn Zobeir was recognized as caliph in Medina, where Jezid was detested for his voluptuousness and scepticism. On this account Medina was invested, stormed and sacked; and Mecca, in which Abdallah took shelter, was besieged, but during the siege Jezid died.

After Jezid's death (683 A.D., Heg. 64) his son, Moawiyah II, a weak but pious youth, became caliph, but after a reign of 40 days he died when he was meditating abdication. By this time Abdallah Ebn Zobeir had caused himself to be proclaimed as Prince of the True Believers, and he had a powerful following. For a period anarchy prevailed. Irak, Hejaz, Yemen and Egypt acknowledged Abdallah Ebn Zobeir as caliph. In Syria, Dehac, regent to Abdallah, was at first chosen caliph; but the people of Damascus appointed Merwan I, of the race of the Ommiades, caliph, who made himself master of all Syria and Egypt. Khorasan separated from the caliphate, and submitted to a prince of its own choosing — the noble Salem. In the following year (684 A.D., Heg. 65) Soliman Ebn Sarad excited a great rebellion of the discontented in Syria and Arabia, and pronounced both caliphs deposed, but was defeated by the experienced soldier Obeidallah. Merwan (who died in 685) had been compelled to promise on oath to leave the caliphate to Khaled, the son of Jezid, yet he nominated his son Abdalmelek as his successor. Under him (685 A.D., Heg. 65) Mokthar, a new rebel against both caliphs, was subdued by one of them, Abdallah (686 A.D., Heg. 67); but this only made Abdallah more formidable to Abdalmelek, who, in order to be able to direct all his forces against him, concluded a peace with the Greek emperor, Justinian II, in which, reversing the order of the Koran, he conceded to the Christians a yearly tribute of 50,000 pieces of gold. He then marched against Abdallah, defeated him twice, and took Mecca by assault. In this last conflict Abdallah fell. Thus Abdalmelek united under his dominion all the Mussulmans; but the resistance of governors and wars with the Greeks kept him constantly occupied. He was the first caliph that caused money to be coined. He died 705 A.D. (Heg. 86). Under Walid I, his son, the Arabs conquered in the east Charasm and Turkestan (707 A.D., Heg. 88); in the north Galatia (710 A.D.); and in the west Spain (711 A.D.). (See SPAIN). He died in 716 (Heg. 97). His brother and successor, Soliman, besieged Constantinople, but his fleet was destroyed by Greek fire, and his army suffered severely from famine. He died while on his way to take part in the siege in 717 (Heg. 99).

Omar II, his successor by Soliman's last will, was equally unsuccessful in the conduct of the war. Having incurred the displeasure of the Ommiades by his indulgence toward the sect of Ali, he was poisoned by them (721 A.D., Heg. 102). Jezid II, his successor also for the disposition of Soliman, died of grief for the loss of a female favorite, of whose death he was the author (723 A.D., Heg. 104). His successor was Hisham, who reigned till 743. He had to suppress several revolts, the chief being that of Zaid (739–40). About this time the Abbassides, descendants of Abbas, son of Abdalmotaleb, uncle of the Prophet, began to be formidable. Under Hisham an end was put to the progress of the Saracens in the west by the energy of Charles Martel, who annihilated their armies at Tours in 732, and at Narbonne in 736. Walid II was murdered after a reign of one year (744 A.D., Heg. 124).

After the still briefer reigns of Jezid III and of his brother Ibrahim, Merwan II followed, with the surname (respectable among the Arabs) of the Ass (Al Hemar). Ibrahim, the Abbasside leader, being imprisoned and put to death by this prince, his brother, Abul Abbas, took up the cause of the Abbassides and assumed the title of caliph. In the resulting war Medwan was twice defeated, and fell (750 A.D., Heg. 133). With him terminates the series of caliphs of the race of Ommiyah. The furious Abdallah, uncle of Ibrahim and Abul Abbas, treacherously destroyed almost all the Ommiades by a horrible massacre at a meeting to which they had been inveigled. One of the family, Abderrahman, grandson of Hisham, having taken refuge in Spain, escaped the massacre and founded the independent caliphate of Cordova. See SPAIN.

Abul Abbas, first of the Abbasside caliphs, died young in 754 A.D. (Heg. 136). His brother, Abu Giafar, called Al Mansur ("the Victorious"), was obliged to contend with a rival in his uncle, Abdallah, whom he, however, overcame. He acquired his surname by his victories in Armenia, Cilicia and Cappadocia. Spain was lost by him, however, as well as Africa. In the year 764 he founded the city of Bagdad on the Tigris, and transferred thither the seat of the caliphate (768 A.D., Heg. 149). He died on a pilgrimage to Mecca, leaving immense treasures (775 A.D., Heg. 158). Mohammed Mahdi, his son and successor, a man of a noble character, had to contend with the turbulent inhabitants of Khorasan under the pretended prophet, Hakem, and died 785 A.D.; and Musa or Hadi, his grandson, met with the same opposition from the Ali party under Houssain. Hadi's mother was a strong-minded, ambitious woman, who wished to rule her son, and with him the state, and this led him to try to poison her. She, however, caused him to be smothered before he could effect his purpose.

Hadi was followed, not by his son, but by his brother Harun (786 A.D.), who was denominated Al Rashid ("The Upright") on account of his justice, and is famous for promoting the arts and sciences. He concluded a truce (an actual peace could never be made with Christians) with the Greek empress, Irene (788 A.D.), who consented to pay him tribute. Yahya, a member of the house of Ali, disputed with him the possession of the throne, but subsequently submitted. Harun, however, tarnished his reputation by the murder of Yahya, and still more by the murder of his sister, and her favorite, the Barmecide Giafar, and by the expulsion and persecution of the whole family of the Barmecides, whose services to the state and himself had been of very great value. Harun divided the empire among his three sons. Al Amin, as sole caliph, was to reign over Irak, Arabia, Syria, Egypt and the rest of Africa: under him Al Mamun was to govern Persia, Turkestan, Khorasan, and the whole East; and Motassem was to rule Asia Minor, Armenia and all the countries on the Black Sea. The younger brothers were to succeed Amin in the caliphate. Thus, in Khorasan, through which Harun was passing, in order to quell a rebellion that had broken out in Samarcand, he was arrested by death, of which he had been forewarned by extraordinary dreams (809 A.D., Heg. 190).

Al Amin the faithful (his proper name was Mohammed) was undeserving of this name. Untrue to his obligations as a ruler, and addicted to all kinds of sensuality, he left the discharge of his duties to his vizier, Fadhel. The vizier, from hatred of Mamun, persuaded the caliph to appoint his son his successor, and deprive Motassem of his portion of territory. A war arose between the brothers. Mamun's general, Thaher, defeated the armies of the caliph, took Bagdad, and caused Amin to be put to death (813 A.D., Heg. 194).

Mamun was recognized as caliph. Nobler in his inclinations than Amin, he cherished the arts and sciences but, like his brother, he left the government and armies to his ministers. His measures to secure the caliphate to the Alides in order to please Riza, his favorite, excited the powerful Abbassides to an insurrection. They declared Mamun to have forfeited the throne, and proclaimed Ibrahim caliph, but submitted again, after the death of Riza, when the caliph had changed his sentiments. The vast empire of the Arabs, embracing numberless provinces in two quarters of the globe, could hardly be held under his sceptre. There is but one step, and that an easy one, under a weak sovereign, from a vice-royalty to a kingdom. The wisdom of the former Abbassides could only retard this evil; the faults of the latter precipitated it. Even under Harun Al Rashid the Agladides had founded an independent empire in Tunis (800 A.D., Heg. 181), as had likewise the Edrisides in Fez. Thaher, having been appointed governor of Khorasan, made himself independent. From him the Thaherides derived their origin. Mamun sent Thomas, a Greek exile, with an army against the Greek emperor, Michael II the Stammerer. Thomas depopulated Asia Minor, and laid siege to Constantinople; but a storm destroyed his fleet (823 A.D., Heg. 207). A second attack on the imperial city was repelled by the aid of the Bulgarians. Thomas was taken prisoner and executed. Toward the many religious sects into which the Mussulmans were then divided Mamun acted with toleration. He died 833 A.D. (Heg. 218). During his government (about 830 A.D., Heg. 215), the African Arabs conquered Sicily and Sardinia, where they maintained themselves about 200 years, till the latter island was torn from them by the Pisans in 1016–17, and the former island by the Normans between 1061 and 1090.

Motassem, at first named Billah (by the grace of God), Harun's third son, built a new city, Samara, 56 miles from Bagdad, and transferred thither his residence. In his wars against the Greeks and rebellious Persians he first used Turkish soldiers. From grief at the death of his private physician, Motassem became insane, and died 842 A.D. (Heg. 227).

Vathek Billah, his son, member of the Motazelite sect, exerted himself to promote the advancement of science; but he was an enervated voluptuary, and died of nervous weakness (846 A.D., Heg. 232). A contest for the succession, between his brother Motawackel and his son Mothadi, was decided by the already powerful and arrogant Turkish bodyguard in favor of the former, the more unworthy competitor. Under Motawackel it became more and more customary to carry on all wars by means of Turkish mercenaries. Thus the Arabs were rendered unwarlike and effeminate, as must necessarily be the case in a hot climate with those who do not live in constant activity. Motawackel manifested a blind hatred of the Alides, not sparing even the memory of the deceased. He moreover evinced a malignant spirit, and a proneness to sensuality and cruelty. His own son, Montasser, trained to early indulgence in both these vices, and often barbarously treated by him, conspired against him with the Turkish bodyguards and effected his murder (861 A.D., Heg. 247).

The Turks, who now arrogated the right of electing the caliphs, called the murderer to the throne of the faithful, and compelled his brothers, who were innocent of the atrocious act, and whose revenge they feared, to renounce the succession which had been designed for them by Motawackel. Montasser died soon after of a fever, caused by the goadings of remorse (862 A.D., Heg. 248). The Turks then elected Mostain Billah, a grandson of the Caliph Motassem. Two of the Alides became competitors with him for the caliphate. One of them, at Cufa, was defeated and put to death; but the other founded an independent empire in Tabristan, which subsisted half a century. The discord of the Turkish soldiers completed the dismemberment of the empire. One party raised to the throne Motaz, second son of Motawackel, and compelled Mostain to abdicate. Motaz Billah soon found means to get rid of him as well as of his own brother Muwiad. He then meditated the removal of the Turkish soldiers; but before he found courage to execute his projects they rebelled on account of their pay being in arrear, and forced him to resign the government. He soon after died (869 A.D., Heg. 255). They conferred the caliphate on Mohadi Billah, son of the Caliph Vathek, but deposed this excellent prince 11 months after, because he attempted to improve their military discipline.

Under Motawackel's third son, the sensual Motamed Billah, whom they next called to the caliphate, Muaffek his brother succeeded, by his prudence and courage, in overcoming the dangerous preponderance of these Turks. Motamed transferred the seat of the caliphate from Samara back to Bagdad in the year 873 (Heg. 259), where it afterward continued. In the same year, owing to a revolution in the independent government of Khorasan, the dynasty of the Thaherides gave place to that of the Soffarides, who eventually extended their dominion over Tabristan and Segestan. The governor of Egypt and Syria, Achmet Ben Tulun, also made himself independent (877 A.D., Heg. 263), from whom are descended the Tulunides. The brave Muaffek annihilated, indeed, the empire of the Zinghians, in Cufa and Bassora, 10 years after its formation (881 A.D., Heg. 268); but he was unable to save the caliphate from the ruin, to which it was continually hastening.

Motamed died soon after him (892 A.D., Heg. 279), and was succeeded by Muaffek's son, Mothadad Billah. He contended unsuccessfully with a new sect that had arisen in Irak — the Carmathians (899 A.D., Heg. 286) — against whom his son, Moktaphi Billah (902 A.D., Heg. 289), was more fortunate. He was still more successful in a war against the Tulunides, as he again reduced Egypt and Syria in 905 (Heg. 292). Under his brother, Moktadar Billah, who succeeded him at the age of 13 years (909 A.D., Heg. 296), rebellions and bloody quarrels about the sovereignty disturbed the government of the empire. He was several times deposed and reinstated, and finally murdered (931 A.D., Heg. 319). During his reign Abu Mohammed Obeidallah rose in Africa, who, pretending to be descended from Fatima, daughter of the Prophet (therefore from Ali), overthrew the dynasty of the Agladides in Tunis, and founded that of the Fatimites (910 A.D., Heg. 298). Not satisfied with reigning independent of the caliph, this party, as descendants of the Prophet, asserted themselves to be the only lawful caliphs.

Shortly afterward the dynasty of the Bouides, in Persia, rose to authority and power (925 A.D., Heg. 315). Khorasan was still independent. The only change was that the Samanides had taken the place of the Soffarides. In a part of Arabia the heretic Carmathians ruled; in Mesopotamia, the Hamadamites. In Egypt, which had just been recovered, Akschid, from a governor, was called to be a sovereign. From him descended the Akschidites. Kaher Billah, Mothadad's third son, merited his fate, on account of his malice and cruelty. The Turkish soldiers having recovered their power drove him from the throne into exile (934 A.D., Heg. 322), in which he perished five years afterward. Rhadi Billah, his brother, bore the dignity of an emir al omra ("captain of the captains"), with which the exercise of absolute power, in the name of the caliph, was united; and thus the caliph was more and more thrown into the background. The first who was invested with this dignity was Raik; but it was soon torn from him by the Turk Jakan, by force of arms, in the year 939 (Heg. 327). Jakan extended the power of the office to such a degree as to leave the caliph nothing, but the name of his temporal sway, and even assumed the right of determining the succession to the throne. Raik was indemnified by receiving Cufa, Bassora and Irak Arabi as an independent government.

The next caliph, Motaki Billah, Moktader's son, made an effort to regain his independence by the murder of Jakun; but he was soon compelled by the Turkish soldiers to appoint Tozun, another of their countrymen, emir, who made this office hereditary. He formally devised it to a certain Schirzad, but it soon came into the possession of the Persian royal house of the Bouides, whose aid the succeeding caliph, Mostaki Billah, solicited against the tyranny of Schirzad. The first Bouide emir, Moezeddulat, left it as an inheritance to his posterity. Not the caliph but the emir now reigned in Bagdad, though over only a small territory. In every remote province there were independent princes.

To continue the catalogue of the names of those who were henceforward caliphs would be superfluous, for these Mussulman popes had not by any means the power of the Christian. It would be too tedious to trace the branches into which the history of the caliphate is now divided; but we must briefly show the great changes which the different states and their dynasties have undergone, and which gave rise to the dominion of the Ottoman Porte.

During the minority of the Akschidite Ali, the Fatimite Morz Ledinillah, at that time caliph in Tunis, subjugated Egypt in 969 (Heg. 358), and founded Cairo, which he made the seat of his caliphate. There were, consequently, at this time three caliphs,— at Bagdad, Cairo and Cordova,— each of which declared the others heretics. But the Fatimites as well as the Abbassides fell under the power of their viziers, and, like them, the Ommiades in Cordova were deprived of all power by the division of Spain into many small sovereignties, till they were entirely subverted by the Morabethun.

Ilkan, King of Turkestan, having conquered Khorasan, and overthrown the Samanides, was expelled again by Mahmud, Prince of Gazna, who founded there the dominion of the Gaznevides, in 998 (Heg. 388), who were soon, however, overthrown in turn by the Seljuk Turks under Togrul Beg, in 1030 (Heg. 421). This leader conquered also Charasm, Georgia and the Persian Irak. Called to the assistance of the Caliph Kajem Bemeillah, at Bagdad, against the tyranny of the Bouide emirs, he proceeded to Bagdad, and became emir himself in 1055 (Heg. 448), by which means the dominion of the Turks was firmly established over all the Mussulmans. To his nephew, Alp Arslan (who defeated and took prisoner the Greek Emperor Romanus Diogenes), he left this dignity, with so great power that these Turkish emirs al omra were frequently called the Sultans of Bagdad. Turkish princes, who aspired to be sovereigns in the other provinces, were at first satisfied with the title of atabek (father, teacher), such as the atabeks of Irak and Syria, of Azerbijan, Farsistan (Persia) and Laristan. It was the atabeks of Syria and Irak with whom the Crusaders had principally to contend. The first was called Omadeddin Zenghi; by the Franks, Sanguin. They were afterward termed sultans. The Caliph of Bagdad was recognized by all as the spiritual sovereign of all Mussulmans: his temporal authority did not extend beyond the walls of Bagdad. Noureddin, Zenghi's son, being requested by the Fatimite caliph Adhed to protect Bagdad against his vizier, sent to Cairo, in succession, Shirkuh and Salaheddin or Saladin; but the latter overthrew the Fatimites (as schismatic anti-popes), and usurped the authority of Sultan of Egypt in 1170 (Heg. 556) with which he united Syria, after Noureddin's death. This is the great Salaheddin (Saladin), the formidable enemy of the Christians, the conqueror of Jerusalem. The dynasty which commenced with him was called, from his father, Ayoub, the Ayoubite. They reigned over Egypt till expelled by the Mamelukes in 1250. The Seljuk sultans of Irak were overthrown in 1194 (Heg. 590) by the Charasmians; and as those of Khorasan were extinct, there remained of the Seljuk dominions nothing but the empire of Iconium or Roum, in Asia Minor, from which the present Turkish empire derives its origin. See Ottoman Empire.

The Charasmian Sultans extended their conquests far into Asia, until their territories were invaded by the Tartars under Genghis Khan, in 1220 (Heg. 617). They were finally totally destroyed by his son Octai. Bagdad, also, the remains of the possessions of the caliphs, became the easy prey of a Mongol horde under Holagu, in 1258 (Heg. 636), by the treachery of the vizier Al Kami, and a slave, Amram, under the 56th caliph Motazem. The nephew of the cruelly murdered Motazem fled to Egypt, where he continued to be called caliph under the protection of the Mamelukes, and bequeathed the Mohammedan popedom to his posterity. When the Turks conquered Egypt, in 1517, the last of these nominal caliphs was carried to Constantinople and died, after returning to Egypt in 1538. The Turkish Sultans subsequently assumed the title of caliph, and have retained it to the present day, with the claim of spiritual supremacy over all Mussulmans, though this claim is little regarded outside his own dominions, and strongly disputed by the Persians. Consult Muir, Sir William, 'Annals of the Early Caliphate' (London 1883); id., 'The Caliphate: Its Rise, Decline and Fall' (ib. 1891); Syed Ameer Ali, 'A Short History of the Saracens' (New York 1899); Lane-Poole, S., 'The Mohammedan Dynasties' (London 1894); Weil, 'Geschichte der Chalifen' (5 vols., Mannheim and Stuttgart 1846–62).

CALIPPUS, a Greek astronomer, who was the first to discover the inaccuracy of the golden number or period invented by Meton, and attempted to remedy it by the invention of a new cycle of 76 years, being only six hours less than the quadruple of Meton's period. It commenced 331 B.C., and being adopted particularly by astronomers in giving the date of their observations, is frequently mentioned by Ptolemy. Though more perfect than Meton's period, it was shown to be inaccurate by Hippocrates, who substituted for it a cycle of 345 years.

CALISAYA BARK, the yellowish bark of *Cinchona Calisaya* (q.v.).

CALISTHENICS, or **CALLISTHENICS**, the art of promoting gracefulness, strength and health by means of the lighter forms of gymnastic exercise. See Gymnastics.

CALIVER, an early form of hand-gun, musket or arquebuse, lighter and shorter than the original musket, fired without a rest and much more rapidly. It seems to have gone out of fashion about 1630. Its name is derived from the fact that the bore was of uniform calibre, so that a common supply of bullets might be used by an entire company.

CALIXTINES, ka-lĭks'tĭnz, or **UTRAQUISTS**, a sect of the Hussites in Bohemia (q.v.), who differed from the Roman Catholics principally in giving the cup in the Lord's Supper to laymen, from which circumstance they got their name, derived from the Latin *calix*, "a cup."

CALIXTUS, the name of several popes. 1. The first of this name, a Roman bishop, was the 17th pope (217 to 224, or from 218 to 223), when he suffered martyrdom according to some accounts. 2. Guido, son of Count William of Burgundy, archbishop of Vienne, and papal legate in France, was elected in 1119, in the monastery of Clugny, successor of the expelled Pope, Gelasius II, who had been driven from Italy by the Emperor Henry V, and had died in this monastery. In the same year he held councils at Toulouse and at Rheims, the latter of which was intended to settle the protracted dispute respecting the right of investiture. As the Emperor Henry V would not confirm an agreement which he had already made on this subject, Calixtus repeated anew the excommunication which he had already pronounced against him when legate in 1112. He excommunicated also the anti-pope, Gregory VIII, and renewed former decrees respecting simony, lay investiture and the marriage of priests. Successful in his contest with the Emperor on the subject of investiture, by means of his alliance with the rebels in Germany, in particular with the Saxons, he made his entrance into Italy in 1120, and with great pomp into Rome itself; took Gregory VIII prisoner in 1121, and banished him to a monastery. He availed himself of the troubles of the Emperor to force him, in 1122, to agree to the Concordat of Worms. After an energetic pontificate he died in 1124. 3. CALIXTUS III, chosen in 1168 in Rome as anti-pope to Paschal III, and confirmed by the Emperor Frederick I in 1178, was obliged to submit to Pope Alexander III. As he was not counted among the legal popes, a subsequent Pope was called Calixtus III. This was a Spanish nobleman, Alfonso Borgia, counsellor of Alfonso, King of Aragon and the Sicilies. He was made Pope in 1455. He was at this time far advanced in life, but equalled in policy and energy the most enterprising rulers of the Church. He appointed an ecclesiastical commission to reconsider the case against Jeanne d'Arc, and its decision was that she died a martyr to her faith, her king and her country. In order to appease the displeasure of the princes and nations occasioned by the proceedings of the councils of Constance and Basel, he instigated them to a crusade against the Turks. His intention was counteracted in Germany by the discontent of the states of the empire with the Concordat of Vienna, and in France by the appeals of the universities of Paris and Toulouse against the tithe for the Turkish war. King Alfonso, moreover, was indignant at the refusal of the Pope to acknowledge his natural son Ferdinand as king of Naples.

CALIXTUS (properly CALLISEN), **Georg**, gā'ōrg, German clergyman, the most able and enlightened theologian of the Lutheran Church in the 17th century: b. Medelbye, Schleswig, 14 Dec. 1586; d. 19 March 1656. In 1609 he visited the universities of the south of Germany; in 1612 those of Holland, Britain and France, where his intercourse with the different religious parties and the greatest scholars of his time developed that independence and liberality of opinion for which he was distinguished. In 1614 he was made professor of theology at Helmstedt, and he held this post till his death. His treatises on the authority of the Holy Scriptures, transubstantiation, celibacy, supremacy of the Pope, and the Lord's Supper belong, even according to the judgment of learned Roman Catholics, to the most profound and acute writings against Roman Catholicism. But his genius and the depth of his exigetic and historical knowledge exposed him to the persecutions of the zealots of his time. His assertion that the points of difference between Calvinists and Lutherans were of less importance than the doctrines in which they were agreed, and that the doctrine of the Trinity was less distinctly expressed in the Old Testament than in the New, and his recommendation of good works, drew upon him the reproach of heresy. He made Christian morality a distinct branch of science, and, by reviving the study of the Christian fathers and of the history of the Church, prepared the way for Spener, Thomasius and Semler. Consult Henke, E. L. W., 'Calixt und seine Zeit' (Halle 1853–56); Dowding, W. C., 'German Theology during the Thirty Years' War'; 'The Life and Correspondence of G. Calixtus' (London 1863).

CALKING, kôk'ĭng, the process of driving tarred oakum into the seams between the planks of ships, in order to render the joints water-tight. A wisp of the oakum is drawn out and rolled together between the hands, and, being laid over the seam, is driven by a wedge-shaped instrument called a calking iron. The work is afterward gone over with a more powerful instrument of the same kind, which is held by one man and struck with a beetle held by another. When all the oakum is forced in that is practicable, the seams are payed over with melted pitch, and where they are to be covered with copper, a thread of spun yarn is laid in to make them flush with the planks.

CALKINS, Franklin Welles, American author: b. Iowa County, Wis., 5 June 1857. He was an early explorer of parts of Black Hills of South Dakota and made acquaintance with many Indian tribes. His studies of bird and animal life have given him rank as a natr uralist. He was educated for the law and had practice in counsel; also had experience as ranchman and railway contractor. He began writing for *The Youth's Companion* at 22 years of age and has been one of the chief contributors to that magazine for 35 years; is author of a number of syndicate serials which have been running in various magazine sections of newspapers for 30 years, and contributes to many periodicals; author of 'Tales Of The West' (3 vols., 1893); 'The Cougar-Tamer' (1899); 'My Host The Enemy' (1901); 'Two Wilderness Voyagers' (1902); 'The Wooing of Tokala' (1907).

CALKINS, Gary Nathan, American scientist: b. Valparaiso, Ind., 18 Jan. 1869. He was graduated at the Massachusetts Institute of Technology in 1890. He received the degree of Ph.D. at Columbia in 1898. In 1900 he became instructor in zoology at Columbia University; adjunct professor of zoology 1902; professor of protozoology 1909. He was biologist of the New York State Cancer Laboratory 1904–08; president of the American Association for Cancer Research 1913–14; and is vice-president of the Society of Experimental Biology and Medicine. He has published 'The Protozoa' (1901); 'Protozoology' (1909); 'Biology' (1914); also numerous scientific papers.

CALKINS, Mary Whiton, American psychologist, educator and author: b. Hartford, Conn., 30 March 1863. She studied at Smith College and at Clark and Harvard universities and from 1891 was instructor and afterward professor of philosophy and psychology at Wellesley College. Her published works include 'Introduction to Psychology' (1901;

1905); 'Der doppelte Standpunkt in der Psychologie' (1905); 'The Persistent Problems of Philosophy' (1907; 3d ed., 1912); 'A First Book in Psychology' (1909; 2d ed., 1911).

CALKINS, Raymond, American Congregational clergyman: b. Buffalo, N. Y., 10 Aug. 1869. A graduate of Harvard University in 1890, after teaching experience in Belmont, Cal., and in Grinnell, then Iowa, College, he became instructor in German at Harvard and a student of the Harvard Divinity School 1893–95. He was ordained in 1896 and after pastorates in Pittsfield, Mass., and Portland, Maine, from 1912 was pastor of the First Church in Cambridge, Mass. Prominent in the national councils of the Congregational Church, he was one of the editors of the 'Hymns of the Church' (1912), and author of 'Substitutes for the Saloon' (1901).

CALL, an American family, several of whose members took a prominent part in the public life of the nation. Daniel, lawyer: b. about 1765; d. Richmond, Va., 20 May 1840. He was a brother-in-law of Chief-Justice John Marshall, and published 'Reports of the Virginia Court of Appeals' (6 vols., 1790–1818; 2d ed., edited by Joseph Tate 1824–33).— His brother, Richard Keith, soldier: b. 1757; d. 1792, was a citizen of Virginia, and was a major in the Revolutionary army. He was one of the seven who cut their way through the British cavalry at Charleston, S. C., 6 May 1780, and escaped. He commanded a rifle corps in the action with Colonel Simcoe at Spencer's Ordinary, Va., 25 June 1781, and at Jamestown, on 6 July, served under General Lafayette. He was elected surveyor-general of Georgia in January 1784.— Their nephew, Richard Keith, soldier: b. near Petersburg, Va., 1791; d. Tallahassee, Fla., 14 Sept. 1862. He was appointed first lieutenant in the 44th infantry, 15 July 1814; brevet captain, 7 Nov. 1814; volunteer aide to General Jackson in April 1818; captain July 1818; and resigned in 1822. He was a member of the legislative council of Florida in April 1822; brigadier-general of West Florida militia in January 1823; delegate to Congress from 1823 to 1825; and receiver of the West Florida land-office in March 1825. He was governor of Florida from 1835 to 1840, and led the army against the Seminoles from 6 Dec. 1835 to 6 Dec. 1836, commanding in the second and third battles of Wahoo Swamp, 18 and 21 Nov. 1836. It is said that at the battle of Omithlacoochie Governor Call personally saved General Clinch and his command from being cut to pieces. A controversy with Joel R. Poinsett, Secretary of War in Van Buren's Cabinet, relative to the misdirection of the war, cost Call his office. He consequently turned Whig, and worked earnestly for Harrison's election, canvassing the Northern States in his behalf. President Harrison reappointed him governor of Florida in 1841, and he held the office till 1844, but was an unsuccessful candidate for the governorship in 1845, when the Territory became a State. Although he had sacrificed fortune, health and popularity to protect the citizens of Florida during the Seminole War, they could not forgive him for turning Whig, and he never again held political office in Florida. Governor Call took great interest in the development of his State. He projected and built the third railroad in the United States, from Tallahassee to Saint Marks, and also located the town of Port Leon, which was afterward destroyed by a cyclone. He always considered himself a Jackson democrat, as opposed to later democracy. Feeling that he had fought at Jackson's side for every inch of ground from Tennessee to the peninsula, he regarded himself as one of the builders of the nation, and during the Civil War was one of the few men in the South that looked on secession as treason. On 12 Feb. 1861, he wrote a long letter to John S. Littell of Pennsylvania, deploring secession, but defending slavery. See also Call, Wilkinson, nephew of the preceding.

CALL, Wilkinson, American lawyer and politician: b. Russellville, Ky., 1834; d. 1910. Early in life he removed to Florida where he was admitted to the bar. He entered the Confederate army in the Civil War and attained the rank of adjutant-general. In 1865 he was elected to the United States Senate, but was not permitted to take his seat. He was again elected in 1879 and served thereafter for 18 years.

CALLA, a genus of plants of the Arum family, containing a single species, growing in bogs in Europe, Asia and eastern North America. The plant commonly cultivated under the name of calla is *Zantedeschia æthiopica*.

CALLAHAN, James Morton, American publicist: b. Bedford, Ind., 4 Nov. 1864. He was graduated at the University of Indiana in 1894 and completed the work for the doctorate at Johns Hopkins in 1897. He was engaged in historical research (at Washington, D. C.) and lecturer on American diplomatic history at Johns Hopkins University 1898–1902, and since 1902 professor of history and political science, West Virginia University. He has written 'Neutrality of the American Lakes' (1898); 'Cuba and International Relations' (1899); 'American Relations in the Pacific and the Far East' (1901); 'Diplomatic History of the Southern Confederacy' (1901); 'The American Expansion Policy' (1908); 'Seward's Mexican Policy' (1909); 'History of West Virginia' (1914); and various monographs and cyclopædia articles. Editor of 'West Virginia University Studies in American History'; Historian of Semi-Centennial Commission of West Virginia, 1913.

CALLAO, kăl-yä'ō, Peru, seaport city, capital of Callao province, on Callao Bay, seven miles by rail, steam and electric, west of Lima. The spacious harbor affords safe anchorage, making Callao the principal port of the country; defended by three forts and sheltered southward by San Lorenzo Island, nine miles in circumference, and rising 600 feet above sea level. An earthquake and tidal wave destroyed the early city in 1746 and the modern city is three-quarters of a mile from the original site. The city itself is uninteresting, and the climate unhealthful. Business centres around the harbor, which is modern in every respect, with concrete piers, floating dock, gas and electric lighting, steam cranes, etc. Over 1,100 vessels of 2,672,000 tonnage enter and clear the port annually. Callao has lumber, iron and sugar manufacturing industries; exports sugar, minerals, cotton, hides, bone, cocoa, wool, etc., to the value of over $7,350,000 annually, and imports coal, beer and manufactured articles valued annually at about $13,434,250. Callao dates from early Spanish times. In 1624 it was besieged unsuccessfully by the British pirate, Clark, who died there. Incorporated as a town in 1671; it was submerged with all its inhabitants during the earthquake of 1746, and when the sea is calm, the ruins are still distinguishable under water. The harbor saw the naval victory of the independent Chileans in 1820 over the Spaniards who surrendered Callao, their last foothold in Peru, the following year. Callao suffered volcanic disasters in 1825 and in 1868. In 1866 it was bombarded by a Spanish fleet and in 1880 by the Chileans who took possession the following year. It was restored to Peru by the treaty of 1883. Pop. 32,000.

CALLAWAY, Morgan, American educator: b. Cuthbert, Ga., 3 Nov. 1862. He was educated at Emory College, Ga., and at Johns Hopkins University, and has been professor of English in the University of Texas from 1890. He has published 'The Absolute Participle in Anglo-Saxon' (1889); 'The Appositive Participle in Anglo-Saxon' (1901); 'The Infinitive in Anglo-Saxon' (1913); and contributions to reviews.

CALLAWAY, Samuel Rodger, American railroad president: b. Toronto, Canada, 24 Dec. 1850; d. New York, 1 June 1904. At the age of 14 he entered the employ of the Grand T. Railway and later was in the service of the Canadian Express Company, and Great W. Railway. His rapid progress thereafter may be summarized as follows: in 1875 he became superintendent of the Detroit and M. Railroad; in 1880, manager of the Chicago and G. T.; in 1884, vice-president of the Union P. and allied lines of nearly 6,000 miles; president of the Toledo, Saint L. and K. C. Railroad, 1887–95; president of the Lake Shore and M. S., 1897–98; president of the New York C. and H. R. Railroad, 1898–1901. He was regarded as one of the ablest railway managers in the United States. From 1901 he was president of the American Locomotive Company.

CALLCOTT, kôl'kŏt, **Sir Augustus Wall**, English painter: b. Kensington, 20 Feb. 1779; d. there, 25 Nov. 1844. He studied portrait-painting under Hoppner, but soon discovered that his genius lay in another department of art, and was so successful in his delineation of landscape, that in 1807 he was elected an associate of the Royal Academy. In 1837 he was knighted, and in 1843 was appointed keeper of the royal collections of pictures. He suffered much from ill health for many years before his death. Callcott excelled in the delineation of coast scenes, and, like Turner, has been called the "Modern Claude." Examples of his paintings are 'The Mouth of the Tyne' (1820); 'Entrance to the Pool of London' (1816); and 'Milton Dictating to his Daughters' (Leeds).

CALLCOTT, John Wall, English composer, brother of Augustus Wall (q.v.): b. Kensington, 20 Nov. 1766; d. near Bristol, 15 May 1821. He at first intended to become a surgeon, but abandoned the intention, and devoted himself to music. In 1785 he competed for the prizes of the Catch Club, and gained three out of four gold medals. In the following decade the same club awarded him 20 medals. In 1790, when Haydn arrived in England, he studied under him, and the same year obtained from Oxford the degree of musical doctor. In 1805 he published his 'Musical Grammar'; and in 1806 was preparing to deliver lectures on music at the Royal Institution when his mind gave way. He never completely recovered, although his insanity left him on one occasion for three years. He ranks among the most eminent of English composers, and was especially celebrated for his glee compositions. His best works were published in two volumes by his son-in-law, Mr. Horsley, in 1824.

CALLEJA DEL REY, **kăl-yā'ha dĕl rā, Felix Maria**, Spanish general: b. Medina del Campo 1750; d. Cadiz 1820. He distinguished himself in Mexico by quelling the insurrection instigated in 1810 by Hidalgo, who was on the point of seizing the city of Mexico, when Calleja was charged by the viceroy, Venegas, to oppose his progress. After encounters, in which both parties strove to surpass each other in a display of cruelty and brutality, Calleja succeeded in defeating Hidalgo's army, and on 2 Jan. 1812, he took possession of the principal fortress Zitaquaro, and massacred the inhabitants. Hidalgo, who fell near Guadalajara, was succeeded by the priest, Morelos, who defended Cuautla Amilpas against the attack of Calleja with great bravery until 2 May 1812, when famine forced him to surrender. Calleja again signalized his victory by acts of barbarism, and was rewarded for his zeal, 4 March 1813, by the appointment of viceroy, in which capacity he continued to alienate the feelings of the Mexicans by his relentless rigor. The priest, Morelos, fell into his hands and was shot, 22 Dec. 1815. Subsequently he promulgated an amnesty, but as he was unable to restore peace to the distracted country, he was recalled. On his return to Spain he was created Conde de Calderon, and in January 1820, while preparing to sail from Cadiz against the revolutionists of Paraguay, his troops having mutinied, he was captured and remained prisoner in the fortress of the Isla de Leon until the insurrection was quelled by Ferdinand VII, when he died, soon after having recovered his liberty.

CALLENDER, Hugh Longbourne, English physicist: b. Hatherop 1863. A student of Trinity College, Cambridge, since 1902 he is professor of physics at the Imperial College of Science, London, having previously held a similar position at McGill University, Montreal 1893–98, and at University College, London, 1898–1902. He is author of 'Law of Condensation of Steam' (1898); and 'The Imperial College of Science' (London 1904).

CALLENDER, James Thomas, American publicist: b. Scotland; d. 1813. He came to Philadelphia as a refugee from England in 1790 having been exiled for his pamphlet 'The Political Progress of Great Britain.' He published, in America, *The Political Register, The American Register*, and was editor of the Richmond *Recorder*. He wrote 'Sketches of the History of America'; 'The Prospect Before Us.'

CALLENDER, John, American historian and Baptist minister: b. Boston, Mass., 1706; d. Newport, R. I., 26 Jan. 1748. He collected many valuable papers relating to the Baptists in America; and published 'A Centennial Discourse on the Civil and Religious Affairs of the Colony of Rhode Island' (1739), which was the only history of that State for more than a century. The State Historical Society reprinted it, with notes by Rev. Romeo Elton (1838), and a memoir of the author.

CALLET, kä-lā, **Antoine François,** French historical painter: b. Paris 1741; d. Paris 1823. He obtained the grand prize in 1764 for a painting entitled 'Biton and Cléobis dragging the chariot of their mother to the temple of Heré.' This picture was purchased by the Academy. Among his noted paintings are 'Winter Saturnalia,' 'The Festival of Bacchus,' 'Summer,' 'Spring' (all four in the Louvre), 'Battle of Marengo,' 'The First Consul entering Lyons,' 'The XVIII Brumaire,' 'Auto-photo,' 'The Marriage of Napoleon and Marie-Louise,' 'Birth of the King of Rome,' 'Capitulation of Ulm,' Battle of Austerlitz.' Callet was one of the best decorative painters of his day, and became a member of the Academy in 1780. He painted three portraits of Louis XVI, one each of Louis XVIII and the Comte d'Artois and Comte de Vergennes, then Minister of Foreign Affairs, and several other portraits now in the Louvre.

CALLET, Jean François, French mathematician and educationalist: b. Versailles, 25 Oct. 1744; d. Paris, 14 Nov. 1798. He completed his studies at Paris in 1768, and in 1779 gained the prize which the Academy of Arts at Geneva had offered for escapements in watches. In 1788 he was appointed professor of hydrography at Vannes and shortly after obtained the same appointment at Dunkirk. He was afterward professor in the school of geographical engineers, Paris. He is best known by his 'Tables of Logarithms.' He was also one of the first to propose a regular "telegraphic" code for commercial purposes, using the word "telegraphic" in the French sense.

CALLEY, Walter, American Baptist clergyman: b. Dover, Del., 19 Aug. 1858. A graduate of Crozier Theological Seminary at Upland, Pa., he was ordained to the ministry in 1880 and after holding pastorates at Bethlehem, Pa., 1880–82; Lehigh Avenue Church, Philadelphia, Pa., 1882–91; Emmanuel Church, Cambridge, Mass., 1891–93; Tabernacle Church, Boston, 1893–1902; Upland, 1905–09, in the latter year he became pastor of the First Church, Jamaica Plain, Boston. He specialized in sociology and penology, was one of the founders of Prospect Union, an affiliation of Harvard Union for the education of workingmen, was general secretary of the Baptist Young People's Union of America, and managing editor of the official magazine *Service* 1902–05.

CALLICRATES, Greek architect of the 5th century B.C. He was a contemporary of Ictinus and with him erected the Parthenon at Athens.

CALLICRATIDAS, a Spartan, succeeded Lysander in the command of the Lacedæmonian fleet against the Athenians, in 406 B.C. He defeated Conon at Mitylene, captured the fleet of Diomedon, and was afterward himself defeated by the Athenians at Arginusæ, where he was drowned.

CALLIÉRES, kä-lyär', **BONNEVUE, Louis Hector, Chevalier de,** French colonial administrator: b. France 1639; d. Quebec, 26 May 1703. He was governor of Montreal in 1684, and impressed on the French government, during a special visit to France, the necessity of capturing New York so as to maintain French supremacy in Canada. He had previously led a division of the French and Indian forces which in 1687 unsuccessfully attacked the Five Nations in New York State. In 1699 he became governor-general of Canada, succeeding Frontenac, and was the founder of Detroit, Mich.

CALLIGONUM, a genus of shrubs belonging to the *Polygonaceæ*. They are leafless plants, with small flowers, branches jointed, dichotomous, and the fruit a large, four-cornered nut. The root of *C. Pallasia,* a leafless shrub found in the sandy steppes of Siberia, furnishes from its roots, when pounded and boiled, a gummy, nutritious substance like tragacanth, on which the Calmucks feed in times of scarcity, at the same time chewing the acid branches and fruit to allay their thirst.

CALLIMACHUS, Greek architect and statuary: d. Athens 396 B.C. He originated the Corinthian capital and designed the mystic golden lamp which shed perpetual light on the Erechtheum. Consult Gardner, W., 'Handbook of Greek Sculpture' (London 1911).

CALLIMACHUS, Greek poet and grammarian: b. Cyrene, about 310 B.C.; d. about 240. He opened in Alexandria a school of grammar, that is, of the *belles-lettres* and liberal sciences, and could boast of several scholars of distinguished attainments, such as Eratosthenes, Apollonius Rhodius, Aristophanes of Byzantium and others. Ptolemy Philadelphus presented him with a place in the museum, and gave him a salary, as he did other men of learning. After the death of Philadelphus, he stood in equal favor with Ptolemy Euergetes. Under these circumstances he wrote most of his works, the number of which was, according to Suidas, over 800. With the exception of some fragments, we have of these only 64 epigrams and six hymns. His works in prose include the 'Tablets' in 120 books (a critical bibliography); 'Memorabilia'; 'Causes' (4 books); in poetry, the best known is his 'Hecale,' which Ovid used in his 'Philemon and Baucis.' In 1893, research in Egypt uncovered some 50 verses of this poem, which are published in Gomerz, 'Neue Bruchstücke aus der Hekale des Kallimachos' (Vienna 1893). His poem on the hair of Berenice has been preserved in the Latin adaptation of Catullus ('De coma Berenices'). 'Callimachus' poems bear the stamp of their age, which sought to supply the want of natural genius by a great ostentation of learning. Instead of noble simple grandeur, they exhibit an overcharged style, a false pathos and a straining after the singular, the antiquated, the learned. His elegies are mentioned by the ancients with great praise and served Propertius as models. The best editions of the hymns and epigrams are those of Meineke (Berlin 1861); Schneider 1870–73; Wilomowitz (Berlin 1897). Consult also Kenyon, 'Recent Greek Literary

Discoveries' (in the *Classical Review,* Vol. VII, pp. 429–30, 1893).

CALLINGER, an ancient hill fort and town in India. See KALINJAR.

CALLINUS OF EPHESUS, the earliest Greek elegiac poet, flourished probably about 700 B.C. Only one elegy and a few fragments are extant; these have been edited by several scholars, among them Bergk, in the 'Poetæ Lyrici Græci' (Leipzig 1878). Consult also Wright, 'A Short History of Greek Literature' (New York 1907).

CALLIOPE, kăl-lī'ō-pē. (1) In Greek mythology, one of the Muses (q.v.) She presided over eloquence and epic poetry. She is said to have been the mother of Orpheus by Apollo. She was represented with an epic poem in one hand and a trumpet in the other, and generally crowned with laurel. (2) An asteroid (No. 22). It was discovered by Hind on 16 Nov. 1852. (3) A musical instrument, consisting of a series of steam whistles, pitched to produce the notes of the scale, and grouped together and operated by a keyboard.

CALLIOPE HUMMING-BIRD. See HUMMING-BIRD.

CALLISTHENES, Greek historian: b. Olynthus, about 365 B.C.; d. 328. He was a nephew and pupil of Aristotle, and was appointed to attend Alexander the Great in his expedition against Persia. His republican sentiments rendered him unfit for a courtier, but his unpardonable crime was his opposition to the assumption of divine honors by the conqueror. On a charge of treason he was put to death, by what method historians are not agreed. Of several historical works written by him only fragments remain. A work on Alexander was once thought to be his, but it has since been proved to be of later date. Consult Christ-Schmid, 'Geschichte der griechischen Litteratur' (Vol. II, Munich 1911).

CALLISTO, in Greek mythology, a nymph of Artemis, daughter of Lycaon, King of Arcadia. According to the most prevalent story of this maiden, Zeus loved her, and her son Arcas was hid in the woods, and preserved, while she was changed by the jealousy of Hera into a bear. Zeus placed her, with her son, among the stars, as the constellation of the Great Bear. Arcas became the ancestor of the Arcadians.

CALLISTRATUS, Athenian orator: b. about 400 B.C.; d. 361. In 377 B.C. he played an active part in the movement for the formation of a new Athenian League. His eloquence is said to have fired the imagination of the youthful Demosthenes. For his Spartan sympathies he was condemned to death by the Athenians, and on his return from exile in Macedonia was actually executed.

CALLOT, Jacques, French etcher: b. Nancy 1592; d. there 1635. He overcame many obstacles to his study of art, twice running away from his parents. He went to Italy, learned drawing in Rome, soon gave himself up entirely to his love for engraving, and became famous for his etchings. He studied with Parigi at Florence and served at the court at Tuscany. In the space of 20 years he designed and executed about 1,600 pieces, most of them, except sacred subjects, representations of battles, sieges, dances, festive processions, etc. The 'Misères et malheurs de la guerre,' in 18 pieces, may be mentioned as a remarkable series. He executed works of this kind for Cosmo II of Florence, Louis XIII of France and the Duke of Lorraine. His 'Fair' and his 'Beggars' are called his best pieces. He was the first who used in his etchings the hard varnish — the *vernice grosso dei lignaiuoli* of the Italians; and was the first to make etching an independent art. He was distinguished for his piety, magnanimity and regularity of life. Consult Méaume, 'Recherches sur la vie et les ouvrages de J. Callot' (Paris 1860), and Green, J. H., 'A Catalogue and Description of the Works of the Celebrated J. Callot' (London 1804).

CALLUNA. See HEATH.

CALLUS, an abnormal hard growth, either carneous or osseous. The new growth of bony substance between the extremities of fractured bones, by which they are united, is an instance of the latter. External friction or pressure produces the former, as in the hands of laborers and the feet of persons who wear ill-fitting shoes. A temporary or provisional callus is a flange of callus formed on the ends of broken bones which move freely upon one another and separate widely; and acts as a splint would. When the amount of callus is excessive, permanent injury may result to neighboring structures since nerves and tendons may be included or a joint rendered useless. Surgical operation is sometimes necessary under these conditions. See CORN.

CALMET, kal-mā', **Augustin,** French exegetical and historical author: b. Mesnil-la-Horgne, near Toul, France, 26 Feb. 1672; d. Paris, 25 Oct. 1757. He entered the order of Saint Benedict in 1688, and became the head of several abbeys in succession. In 1698 he became teacher of philosophy and theology in the abbey of Moyen-Moutier; in 1704, subprior of a convent of learned monks at Münster in Alsace; and in 1706 he went to Paris to undertake the publication of his commentary on the Bible. He afterward became prior at Lay (1715), abbot of Saint Leopold in Nancy (1718), abbot of Senones in Lorraine (1728). He was an industrious compiler of voluminous works. Among them are 'Commentary on the Old and New Testaments' (23 vols., Paris 1707–16); 'Historical and Critical Dictionary of the Bible' (4 vols., Paris 1722–28); and 'Ecclesiastical and Civil History of Lorraine' (4 vols., Nancy 1728; 2d ed., 6 vols., 1745–47). For his life consult Fangé (Senones 1762); Digot, A. (Nancy 1861); for his correspondence, Guillaume, P. E. (Nancy 1875).

CALMETTE, Gaston, French journalist: b. Montpellier 1858; d. Paris, 16 March 1914. As editor of the *Figaro* from 1903, and noted for his fearlessness in attacking his political opponents, regardless of consequences, he was shot and killed by Mme. Caillaux, wife of Joseph Caillaux, Minister of Finance and former Premier, whose private correspondence, obtained surreptitiously, Calmette had threatened to publish. Calmette was a chevalier of the Legion of Honor, and had been decorated with the grand cross of the order of Charles III by the King of Spain.

CALMON, kăl-môṅ, **Marc Antoine,** French political economist: b. Tamnies, Dordogne, 3 March 1815; d. Paris, 13 Oct. 1890. In 1871, he became undersecretary of State in the Department of the Interior, and in December 1872 prefect of the Department of the Seine. He entered the National Assembly as life member in 1875, but will be longest remembered for his writings on political economy, which include 'Les impôts avant 1789' (1865); 'William Pitt, étude financière et parliamentaire' (1865); 'Histoire parliamentaire des finances de la Restauration' (1868–70); 'Etude des finances de l'Angleterre depuis la réforme de Robert Peel, jusque en 1869' (1870); 'Histoire parlementaire des finances de la monarchie de Juillet' (4 vols., 1899). He edited Thiers' 'Discours parlementaires' (15 vols., Paris 1879–83).

CALMON DU PIN E ALMEIDA, Miguel, Brazilian statesman: b. Santa Amara, Bahia, 22 Dec. 1796; d. Rio de Janeiro, 5 Oct. 1865. He entered the Constituent Assembly in 1822, was senator in 1840, Prime Minister in 1840 and again in 1843 and resided in Europe as special envoy 1844–47. He was created viscount in 1849 and Marquis of Abrantes in 1854.

CALMS, Region of, or **Zone of,** tracts in the eastern Atlantic and eastern Pacific oceans, on the confines of the tradewinds, where calms of long duration prevail. This region is not the same all the year through, but follows the course of the sun, and lies farther north or farther south according to the hemisphere in which the sun happens to be. About the winter solstice its average northern limit is in lat. 5° N., and in the months about the summer solstice its average northern limit is about 12° N. lat. The southern limit lies nearly always to the north of the equator, varying between lat. 1° and 3° N.; but it is sometimes, though rarely, so far south as lat. 1° or 2° S. During the months following the winter solstice its average breadth is four degrees, while in the months following the summer solstice it is about six degrees. The calms prevail especially on the northern margin of this region, but even there, there is an occasional light breeze, but not sufficient to fill the sails. The climate of this region is extremely unpleasant, for the atmosphere is moist and foggy, and the sky generally overcast and gloomy, and the heat is intense and unvarying. Almost every day there occurs a violent storm of thunder and lightning, accompanied by sudden blasts of wind, and by rain which falls in regular streams for hours together. On this account the region is dangerous to navigators. To increase these dangers there is between lat. 4° and 10° N., and long. 18° and 23° W., a tract of considerable extent, which seamen call the «rainy sea,» and which, with only rare intervals of calm, is visited by almost constant storms of thunder and lightning, and violent falls of rain, from which it is very difficult for a sailing vessel to make its escape.

CALMUCKS. See KALMUCKS.

CALOCHORTUS, a genus of plants of the lily family, containing about 50 species, natives of western North America. They are known as Mariposa lilies, star tulips and globe tulips. The plants have narrow leaves and showy, tulip-like white or pale or bright yellow flowers, often spotted with darker colors. Many of the species are frequent in cultivation.

CALOMARDE, kä-lō-mär'da, or **CALOMARDA, Francisco Tadeo** (COUNT OF ALMEIDA), Spanish statesman: b. Villel, Aragon, 1775; d. Toulouse, France, 1842. He studied law, entered political life and sustained the national cause in resistance to Napoleon. In 1814 on the return of Ferdinand VII, Calomarde was made chief secretary of the Department of Indian Affairs. Here he was convicted of bribery and banished to Toledo and afterward to Pamplona. In 1815 he held a similar post in the Ministry of Justice, and was made life secretary of the American Order of Isabella the Catholic. In 1823 he received the appointment of secretary to the regency, and subsequently an important office in the royal household, and he was appointed Minister of Justice. He organized the corps of royalist volunteers, recalled the Jesuits, reopened the convents and closed the universities. Ferdinand VII decorated him with the order of Charles II, and on the birth of Isabella he became Knight of the Golden Fleece and, by order of the King of Naples, Duke of Santa Isabel. He established the Pragmatic Sanction of Charles IV, admitting women to the succession. In 1832, when Ferdinand's death was supposed to have taken place, Calomarde was the first to bend his knee before Don Carlos. The King recovered physically, but lingered in a semi-idiotic condition; of this Calomarde took advantage, by extorting from him his signature to the act of 31 Dec. 1832, reintroducing the Salic law, by which Ferdinand abdicated in favor of Don Carlos instead of the Infanta Isabella. When Ferdinand revealed this fraudulent proceeding Calomarde was banished to Aragon, and later avoided imprisonment by escaping to France in disguise. Here he passed the rest of his days in obscurity.

CALOMEL, the sub-chloride, or «mild» chloride of mercury, HgCl (or Hg_2Cl_2), known to chemists as «mercurous chloride,» to distinguish it from corrosive sublimate, $HgCl_2$, which is known as «mercuric chloride.» It is prepared by adding an alkaline chloride to a solution of a mercurious salt, usually the nitrate. The precipitate is thoroughly washed to remove the last remaining trace of the unchanged alkaline chloride. In the use of calomel as a medicine particular attention should be given to its liability to generate corrosive sublimate by decomposition. This effect may be produced by bitter almonds or cherry-laurel water, or any other substance containing hydrocyanic acid, being administered simultaneously with it. Nitro-muriatic acid produces the same effects, as also, to some degree, the chlorides of potassium, sodium and ammonium. If there is any possible chance of its adulteration with corrosive sublimate, it may be tested by shaking a sample with a little alcohol and dipping a knife blade in the solution. The presence of even so minute a proportion of corrosive sublimate as 1/500 of 1 per cent will be shown by a blackening of the steel blade. It is rendered ineffectual by the alkalies and alkaline earths. Calomel is regarded as the most valuable of the mercurial preparations, though some medical innovators reject it. It is employed as a purgative, operating chiefly upon the liver by stimulating its secretory functions. Being slow in its action, and liable to salivate if too long retained, it is usually administered with some saline cathartic. It is also given as a remedy for worms and as an alterative in derangement of the liver. Calomel occurs native in Spain, Bohemia, Serbia, Mexico and elsewhere, in the form of tetragonal crystals white in color (or nearly so) with a hardness of from 1 to 2 and a specific gravity of 6.48. In this form it is known to miners as horn-quicksilver.

CALONNE, kä-lŏn, Charles Alexandre de, French statesman: b. Douai, 20 Jan. 1734; d. Paris, 30 Oct. 1802. He succeeded Necker in 1783 as Comptroller-General of the Finances. In this office he continued till 1787. During this period he maintained the public credit by a punctuality till then unknown in the payments of the royal treasury, though he found it drained to the lowest ebb. He labored with unwearied assiduity to restore the equipoise between the annual income and expenditure, and to provide a supply for the emergencies of the state, without increasing the burdens of the people. For this purpose he advised the King to revive the ancient usage of convening the national assemblies of the «notables,» to whom he proposed the bold project of suppressing the pecuniary privileges and exemptions of the nobility, clergy and magistracy. This measure alarmed those powerful bodies, and Calonne found it necessary to retire to England, where he wrote two defenses of himself — his 'Petition to the King' and 'Reply to Necker.' On the breaking out of the Revolution he supported the Royalist party with much zeal, both by his pen and his journeys to various countries of Europe on their account. Consult Susane, 'La tactique financière de Calonne,' with bibliography (Paris 1902).

CALOPHYLLUM, a genus of trees belonging to the family *Guttiferaceæ,* and natives of warm climates. They have large shining leaves, with numerous transverse parallel veins. Some of the species yield excellent timber. *C. inophyllum* affords a medical resin, the tacamahac of the East Indies. The seeds yield domba oil, which is used for burning, for making ointment, etc. *C. calaba* is a West Indian species whose oil is used for illuminating purposes.

CALORESCENCE, the phenomenon of the transmutation of heat rays into light rays; a peculiar transmutation of the invisible calorific rays, observable beyond the red rays of the spectrum of solar and electric light, into visible luminous rays, by passing them through a solution of iodine in bisulphide of carbon, which intercepts the luminous rays and transmits the calorific. The latter, when brought to a focus, produce a heat strong enough to ignite combustible substances, and to heat up metals to incandescence, the less refrangible calorific rays being converted into rays of higher refrangibility, whereby they become luminous. Tyndall first described it in the book mentioned below. See also Fluorescence. Consult Tyndall, J., 'Heat a Mode of Motion' (New York 1905).

CALORIC (Latin *calor,* «heat»), a name formerly given to a hypothetical, imponderable substance of gaseous form, whose existence was postulated in order to explain the observed phenomena of heat. It is known that no such substance exists, and the word is now practically obsolete, except as an adjective in such expressions as «caloric effect,» «caloric engine,» etc., where it stands for the words «thermal» or «heat,» though sometimes in a special sense. For a statement of the principles of the old caloric theory, consult Metcalfe's 'Caloric' (2 vols., Philadelphia 1859). See also Heat; Thermodynamics.

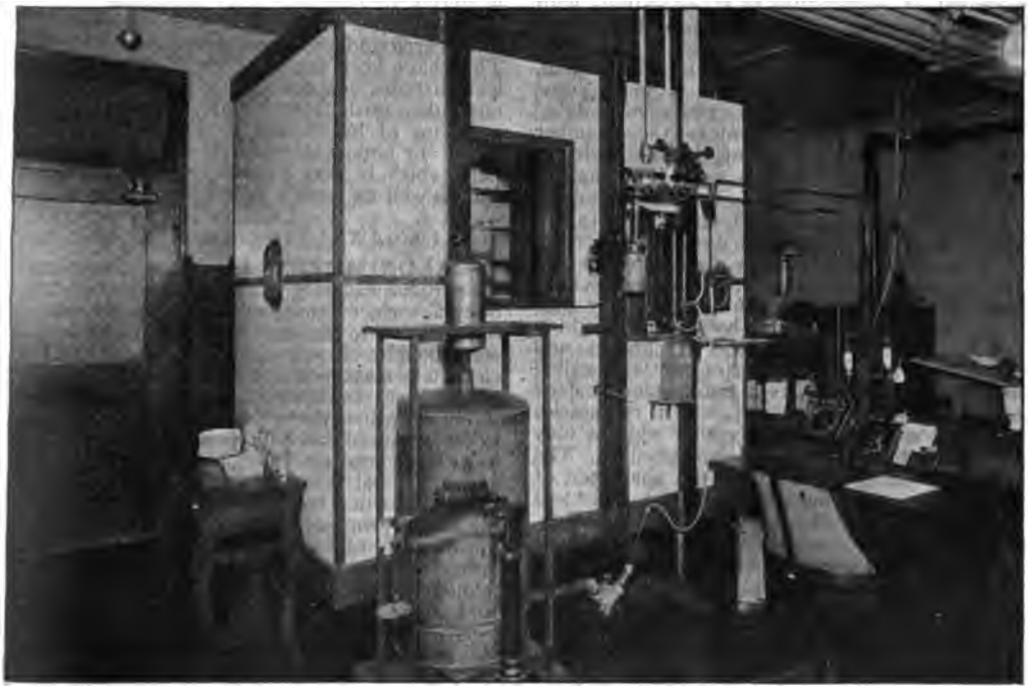
CALORIE, or CALORY, the unit of heat in the c. g. s. system; being the amount of heat necessary to raise the temperature of a kilogram of water one degree Centigrade, or from 4° to 5° C. In ultra-scientific researches the calorie is determined by taking 1/100 part of all the heat required to raise 1 gram of water from 1° to 100° C. It is used as a standard of heat by physicists as the term «foot-pound» is employed as the unit of energy. It is also known as the «greater calorie,» to distinguish it from the «small calorie,» in which the unit of mass is the gram instead of the kilogram. Its mechanical equivalent is 4.187 joules, that being the amount of energy which disappears when one calorie of heat is developed. See Calorimetry.

CALORIMETER, The Respiration. A respiration calorimeter is an instrument of precision by means of which gaseous exchange and heat production can be measured. It comprises a chamber in which the interchange of gases and the production of heat occurs, the walls of which are air-tight and heat-proof, with accessory devices by which any gases added to or removed from the air of the chamber are measured, while the heat imparted to the air of the chamber is also removed and its quantity determined. The apparatus was originally designed for use in the study of fundamental problems of physiology with the living organism, particularly with respect to nutrition, but it has been found valuable for a great variety of other uses.

Investigations of nutrition commonly comprise what are known as complete metabolism experiments. The subject, for example a man, is given a prescribed diet during an experimental period which may continue several days. All his food and drink and all solid and liquid excreta are weighed and samples analyzed. From a comparison of the quantities of elements and compounds in the materials taken into and given off by the body it is possible to tell whether the store of material has increased or decreased under the experimental conditions. In order that the balance may be complete, however, it is necessary to include with the data obtained by analysis of the solids and liquids, the quantities of oxygen consumed, and those of water vapor and carbon dioxide given off by the lungs and skin. To this end the subject remains during some part or all of an experimental period in a device called a respiration apparatus by means of which these quantities may be measured. From all of the data thus obtained it is possible to estimate with considerable accuracy the actual transformation of matter within the body.

The transformations of energy are likewise learned from comparison of the intake and output of energy by the body, the quantities of energy being measured as heat, because other kinds of energy can be converted into heat and whatever the nature of the energy utilized in the body it is ultimately converted into heat, and eliminated from the body as such. The actual income of energy to the body is the difference between the potential energy of the combustible material in the food and drink and that of the unoxidized residues of food and body matérial in the solid and liquid excreta, which are determined by burning samples of each in oxygen in a bomb calorimeter. The actual output of energy by the body is the heat resulting from the expenditure of energy in the maintenance of bodily functions and the performance of muscular work. To measure the amount of energy given off from the body as heat, the respiration apparatus in which the subject spends the experimental period is arranged also as a calorimeter. The term "respiration calorimeter" is intended to signify that the device measures simultaneously the respiratory exchange and the heat output of the body. In recent years a large amount of work has been done with the respiration calorimeter in experiments in which measurements of the gaseous exchange and energy production were the chief end, few or none of the other factors of income and outgo being considered.

Several methods of measuring the respiratory exchange are employed. One of the simplest is that in which a constant current of air is passed into and out of the respiration chamber by means of pipes through the walls, which are otherwise air-tight. The volume of air passed through the chamber is measured, and the composition of the air before it enters and after it leaves is determined, and from these data the quantities of gases imparted to the air by the subject are ascertained. By another method somewhat similar the air leaving the chamber is passed through purifying devices which remove all the carbon dioxide and water vapor from it, the amount of each being found from the gain in weight of its absorber. The quantities of gaseous exhalation can be determined with considerable accuracy in such manner, and with small animals as subjects the consumption of oxygen can also be ascertained; but with larger animals, such as man, the determination of the quantity of oxygen consumed is somewhat more difficult. This can be accomplished more readily by the closed circuit method in which air is withdrawn from the chamber, passed through the purifying devices and returned again to the chamber, and oxygen is supplied to it to replace that used by the subject. The gain in weight of the air purifiers shows how much carbon dioxide and water vapor were brought out of the chamber, and the loss in weight of the oxygen container shows how much of this gas was admitted to it; from these data, with allowance for any change in the composition of the air of the chamber, the actual respiratory exchange by the subject is determined.


Respiration Calorimeter, in Laboratories of the United States Department of Agriculture, Washington, D. C.

Various methods are also employed to determine the amount of heat produced by the subject in the respiration calorimeter. One method in common use at the present time is to take up the heat as fast as it escapes from the body by a current of cold water flowing through a coil of pipe in the chamber. From the weight of water flowing through the coil and the difference between the temperature of the water entering and that of the water leaving the coil, the quantity of heat carried out is computed. This constitutes the major part of the heat given off from the body of the subject. A small part, however, leaves the chamber as latent heat of water vapor in the air, the amount thus carried out being computed by factor from the quantity of water caught in the water absorber. With due allowance for change of temperature of any object in the chamber, the sum of these two quantities represents the quantity of heat produced by the subject. The temperature of the walls of the chamber is controlled so that no heat will be transmitted through them from within or without.

The illustration gives a general view of a respiration calorimeter of this type as employed in the laboratories of the United States Department of Agriculture in investigations with men and women. The respiration chamber of this apparatus is 6½ feet long, 4 feet wide and 6½ feet high. Though it is rather small, a person can remain within it very comfortably during a period of even several days' duration. The subject enters the chamber through the large opening in the side in which a pane of glass is sealed during an experiment, thus serving as a window, though there is a small electric lamp inside to provide further light if needed. There is also a small electrc fan to keep the air stirred, and a telephone by which the subject may communicate with those on the outside. On the walls are hooks for clothing and shelves for books, food receptacles and the like. A tubular opening in one wall, called the «food aperture,» has a tightly closing door on each end by means of which receptacles for food and excreta and other objects may be passed into or out of the chamber. The furniture, which varies with the character of the experiment, comprises a chair, a table and a cot, which may all be folded into small bulk, and devices with which definite amounts of muscular work may be performed.

That this apparatus is sufficiently accurate for the purpose for which it is used is demonstrated by the fact that it measures at least 99 per cent of the quantities of oxygen used and of water vapor, carbon dioxide and heat produced when known amounts of alcohol are burned in test experiments within the chamber.

The first respiration calorimeter employed in America was devised and constructed in the laboratory of Wesleyan University by the late W. O. Atwater, then director of the Office of Experiment Stations of the Department of Agriculture, and professor of chemistry, and Dr. E. B. Rosa, of the United States Bureau of Standards, then professor of physics at Wesleyan University, who began work on it in 1892. The original device combined an open circuit respiration apparatus similar in principle to that of Pettenkofer of Munich, but was altered in detail in accordance with modifications in method of investigation; and a calorimeter that was quite original, the principal features of which were suggested by Professor Rosa. The completion of this apparatus and conducting experiments with it were made part of the investigations on the nutrition of man which were begun by the United States Department of Agriculture in 1894, and were put in charge of Professor Atwater. During the 12 years in which it was in use at Wesleyan University the respiration calorimeter was considerably modified, particularly with respect to the experiments of respiratory exchange, being changed from an open to a closed circuit type to afford better means of determining the oxygen consumption. In 1907 it was transferred to Washington and completely reconstructed in the laboratory of the Department of Agriculture, where it continues in use at the present time. In the same laboratory a smaller respiration calorimeter of similar nature but with modifications that make it to a considerable extent automatic in operation, has been constructed and employed for use in the study of metabolic activity of small magnitude, as, for example, the ripening of fruits, the wintering of bees and other problems.

Respiration calorimeters are important aids in research and are in use in many laboratories. They have been found of great value for clinical purposes and for the study of pathological and other medical problems as well as general problems of health and hygiene. Their application to botanical research opens up a large field which is very promising from a theoretical as well as from a practical standpoint.

Charles F. Langworthy,
United States Department of Agriculture.

CALORIMETRY («heat measurement»), the art of measuring the quantity of heat that a body absorbs or emits when it passes from one temperature to another, or when it undergoes some definite change of state. In order to execute such measurements it is first necessary to adopt some convenient and accurate unit, in terms of which the quantities of heat that are to be measured can be expressed. Several such units have been proposed, but none has yet met with universal favor among physicists. One of the simplest that has been suggested (at least so far as the principles involved are concerned) is the quantity of heat that is required to melt a kilogram or a pound of ice. Evidently it will require precisely 10 times as much heat to melt 10 pounds of ice as to melt one pound and hence, if the quantity of heat required to melt one pound of ice is taken as the unit of heat, the measurement of any given quantity of heat becomes reduced to the simple operation of observing how many pounds of ice the proposed quantity of heat can melt. The earliest form of heat-measuring device (or «calorimeter») based upon this idea is that invented by Dr. Joseph Black about the year 1760. It consists simply of a block of clear ice, in which a cavity is made, the cavity being closed by a slab of ice laid upon the main block. To make the use of this device plain, let us suppose that it is desired to determine the quantity of heat that is given out by a certain fragment of platinum in cooling from 100° F. to the freezing-point. The chamber in the block of ice is first carefully wiped dry, and the platinum, heated accurately to 100°, is quickly introduced, and the covering lid of ice is laid in place. The platinum gives up its heat to the ice about it, with the result that a certain weight of the ice is melted, and a corresponding weight of water collects within the chamber. When it is certain that the platinum has attained the temperature of the ice, the slab covering the excavation in the main block is lifted off, and the water that has collected about the platinum is removed and weighed. The quantity of heat given out by the platinum is then known at once, if the accepted unit of heat is the quantity required to melt one pound of ice. Lavoisier and Laplace improved Black's calorimeter in certain respects, while retaining its main features. Their instrument consists essentially of three distinct concentric chambers. The object upon which the experiment is to be performed is placed in the inner chamber, and the ice whose melting is to serve as a measure of the heat given out is placed, in the form of broken lumps, in the intermediate chamber, surrounding the object to be investigated. In the outer chamber, which encloses the other two as completely as possible, broken ice is also introduced, to prevent the conduction of heat into the apparatus from the outside. The quantity of ice melted is determined by observing the amount of water that is formed in the middle chamber, this being drawn off by a conveniently situated tube and tap. This apparatus has been described as an improvement upon that of Black; but the only way in which it can be said to be an improvement is in the respect that it does not call for large blocks of pure clear ice. In other particulars it is somewhat inferior to the simpler apparatus of Black. The quantity of water that is produced, for example, cannot be determined with the same degree of accuracy in Lavoisier and Laplace's instrument. The ice calorimeter of Bunsen was a far greater advance. This ingenious apparatus consists of an inner chamber, for the reception of the object to be studied, and an outer enveloping one, which is entirely filled with a mixture of ice and water, and from which a graduated capillary tube is led away. The whole instrument is surrounded by broken ice, as in Lavoisier and Laplace's form, in order to protect the interior parts from the effect of external thermal influences. When the apparatus is in perfect working order, the mixture of ice and water in the intermediate chamber should be neither melted nor freezing, but should be in exact equilibrium in this respect. Upon the introduction of the object to be studied into the central chamber, the ice in the intermediate chamber begins to melt, just as in the types of calorimeter already considered; but the essential peculiarity of Bunsen's instrument consists in deducing the quantity of ice that is melted by observing the change of volume of the contents of the intermediate chamber, as shown by the motion of the water in the graduated capillary tube that leads away from that chamber; advantage being taken, for this purpose, of the known fact that ice diminishes in volume upon melting, so that when the exact diminution in the volume of the contents of the intermediate chamber is known, we can calculate with a considerable degree of precision the quantity of ice that has been melted. Bunsen's calorimeter is an admirable instrument, capable of giving results of great accuracy when intelligently handled.

Another unit of heat that suggests itself quite naturally is the quantity of heat given out by a pound of steam when it condenses into a pound of water at the same temperature. A calorimeter based upon this idea was also used by Bunsen, but the steam calorimeter was brought to its present excellent form largely through the labors of Dr. J. Joly. In his type of the instrument the object to be studied is suspended from one arm of a delicate balance. After being accurately counterpoised, the object is bathed in an atmosphere of steam, with the result that it absorbs a certain amount of heat as its temperature rises to that of the steam. But the heat thus absorbed by the body under examination can be obtained only from the steam itself; and, since saturated steam cannot part with heat in this way without condensing, it follows that there is deposited upon the body a weight of condensed moisture that corresponds precisely to the quantity of heat that has been absorbed. The amount of this moisture is determined by careful weighing; and it is evident that the quantity of heat absorbed by the experimental body in passing from its original temperature to the temperature of the steam is then immediately known, if we take, as the unit of heat, the quantity of heat that is given out by a pound of steam in condensing into a pound of water at the same temperature. In practice, numerous corrections are of course necessary, as with all other instruments of precision. It may be added that although the ice and the steam calorimeters are primarily intended to determine the heat emitted or absorbed by a body in passing from any given temperature to some one particular temperature that is always the same (that is, the freezing-point in the one case and the boiling-point in the other), yet it is always possible to determine the quantity of heat emitted or absorbed by the body between any two temperatures, by performing two experiments in succession, the body having these respective temperatures as its initial temperatures in the respective experiments. It is plain that the quantity of heat emitted or absorbed between the proposed initial and terminal temperatures can then be obtained by simply subtracting one of these results from the other.

Another and more familiar unit of heat is the quantity of heat required to warm a given weight of water one degree on a given thermometric scale. (See CALORIC). Thus in general engineering practice in the United States and in England, it is customary to define a heat unit as the quantity of heat that is required in order to raise the temperature of a pound of water one degree on the Fahrenheit scale. This definition is good enough for rough purposes, because it conveniently happens that there is no great difference between the quantity of heat required to warm a pound of water from 32° to 33° and the quantity required (for example) to warm it from 99° to 100°. This, however, we can only regard as a fortunate accident; and for accurate scientific purposes we must recognize that the equality is only approximate, and we must adopt some particular temperature range as a part of our definition. Thus it is common to define the British heat unit, when great accuracy is desired, as the quantity of heat required to raise the temperature of a pound of water from 59° to 60°; although some authorities, apparently without sufficient reason, make the temperature range from 32° to 33°, and others have chosen other positions on the temperature scale for the defining degree. It is unfortunate that no general agreement has yet been reached on this point. In accurate scientific work the unit of heat is usually taken as the quantity of heat required to warm a kilogram of water from 15° C. to 16° C., or (which is practically the same thing) from 14.5° to 15.5° C. It would appear that several very good reasons could be assigned for selecting 40° C. as the standard temperature to be used in defining the heat unit. For example, the specific heat of water has its minimum value not far from that point; or, in other words, any small uncertainty in the actual realization of the temperature contained in the definition would have little or no effect if that temperature were 40° C. Again 40° C. is the temperature at or near which the differences between the various thermometer scales that are in practical use reach their maximum; and this means that at or near this temperature a slight error in the standardization of the thermometer that is used would have the least effect upon the verification of the heat unit. Moreover, 40° C. (104° F.) is a temperature that is likely to be always greater than the general temperature of the laboratory in which work is being carried out; and it is well known to be easier to realize a temperature that is higher than that of the surrounding air, than it is to realize one that is lower. From every point of view, therefore, 40° C. (or thereabouts) would appear to be the best temperature to assume in establishing the definition of the heat unit; a unit of heat being then defined as the quantity of heat required to raise the temperature of a kilogram of water from (say) 39° C. to 40° C. Yet, cogent as these reasons would appear, no authority has yet suggested this particular temperature as the standard.

In measuring the quantity of heat emitted by a body by observing the change of temperature produced in a given mass of water when the water absorbs the heat so emitted, a great variety of forms of apparatus may be used. In some cases the heated body may be plunged into the water directly, the water being kept well stirred, and its temperature taken at the beginning and end of the experiment. In other cases, and especially when the body under examination cannot be allowed to come in contact with the water, it is necessary to adopt some more elaborate method, such as enclosing the experimental body in a water-tight envelope of some kind, and afterward making due allowance for the heat capacity of the envelope. In cases, for example, in which the heat generated by the combustion of fuel is to be measured, the fuel must be enclosed in an air-tight crucible, to which oxygen is admitted by one tube, and from which the products of combustion are drawn off by another. The crucible is surrounded by a mass of water that is disposed in such a way as to intercept and absorb as much of the heat that is produced as possible. A direct observation of the temperature of the water in the calorimeter is made before and after the combustion, and the change of temperature so obtained gives a first approximation to the amount of heat that has been liberated.

This result has to be corrected, however, for the thermal capacity of each part of the calorimeter that has been warmed during the experiment, and for that of the gases admitted and drawn off, and also for any loss of heat that may have occurred through radiation. The precise details of the corrections will vary, however, with the design of the calorimeter, and with the mode of conducting the experiments.

For a discussion of the relations of the different units of heat that have been mentioned above, and for an account of the experiments that have been made for determining the differences in the heat capacities of water at different temperatures, see Heat. Calorimeters (q.v.) constructed on a large scale are used to measure the amount of heat given off by an animal or human being, the amount of food and air supplied being recorded. Considerable success has been attained in ascertaining the fuel value of various foods by W. O. Atwater and by the Nutrition Laboratory of the Carnegie Institution of Washington. A very good account of the subject of calorimetry in general will be found in Preston's 'Theory of Heat' (London 1894), which also contains valuable references to original papers. The various forms of calorimeter that are used in practical engineering are explained and illustrated in Carpenter's 'Text-Book of Experimental Engineering' and in almost all general textbooks on physics. Consult 'Philosophical Transactions of the Royal Society of London' (1894), and Wiedemann's 'Annalen der Physik und der Chemie' (Vol. XXXVII, p. 494, 1889). See Fuel.

CALOTROPIS, a genus of asclepiads forming shrubs or small trees natives of the tropics of Asia and Africa. There are three species, and their flowers have a somewhat bell-shaped corolla, expanding into five divisions. *C. gigantea,* the largest of the genus, forms a branching shrub or small tree about 15 feet high, with a short trunk four or five inches in diameter. Its flowers are of a pretty rose-purple color. Cloth and paper have been made from the silky down of the seeds. The bark of the roots of some species furnishes the substance called mudar, which is used in India as a diaphoretic. The juice has been found very efficacious in the cure of elephantiasis, in syphilis and anasarca. From the bark of the plant is made a substance called mudarine. The bark of the young branches also yields a valuable fibre. The leaves warmed and moistened with oil are applied as a dry fomentation in pains of the stomach; they are a valuable rubefacient. The root, reduced to powder, is given in India to horses. An intoxicating liquor, called bar, is made from the mudar by the hillmen about Mahabuleshwar, in the western Ghauts.

CALOTTISTS (French *Calottiste,* kȧl'ō' tēst'), or the Régiment de la Calotte, a society which sprang up at Paris in the last years of the reign of Louis XIV, and took its name from the word *calotte,* a flat cap formerly worn by the priests, which was the symbol of the society. All were admitted whose odd behavior or character, foolish opinions, etc., had exposed them to public criticism. Every one who made himself particularly ridiculous received letters patent authorizing him to wear the calotte. They had a singular coat of arms, on which was the sceptre of Momus, with bells, apes, rattles, etc. On their principal standard were the words, *Favet Momus, luna influit.* On the death of Torsac, the colonel of the Calottists, the *éloge* (a spirited satire on the academical style) which the Calottists pronounced on this occasion, was suppressed. Aimon, colonel of the guards, hastened to Marshal Villars with their complaints, and concluded with the words, «My lord, since the death of Alexander and Cæsar, the Calottists have not had any protector besides you,» and the order was retracted. They became, however, too bold, attacked the ministers and even the King himself; and the regiment was in consequence dissolved. After the restoration the epithet, *Régime de la Calotte,* was applied to the clerical influence in politics. The 'Mémoires pour servir à l'histoire de la Calotte' (Basel 1725) is an amusing little book. Consult 'Journal historique et anecdotique du règne de Louis XV de l'avocat Barbier' (ed. 1857).

CALOTYPE, a photographic process invented by Talbot, and patented in 1841. Paper saturated with nitrate of silver is dried and then immersed in a solution of potassium iodide for a few minutes, and again dried and kept in the dark. When wanted for use it is brushed over with a solution of the gallo-nitrate of silver, and immediately exposed in the camera. The image thus formed may be left to develop itself, and then thoroughly washed and fixed with hyposulphite of soda; or a customary developer may be used. The process is no longer in use commercially, but is occasionally revived by amateurs.

CALOVIUS (Latinized form of original German name, KALAU), **Abraham,** German Lutheran theologian: b. Mohrungen, Prussia, 16 April 1612; d. 25 Feb. 1686. He became rector of the gymnasium in Danzig (1643) and professor of theology in Wittenberg (1650). He was the chief representative of controversial Lutheran orthodoxy in the 17th century, and waged war incessantly on Arminian, Socinian, Reformed and Roman Catholic doctrines, and with the greatest bitterness against Calixtus. He was six times married, the last time in his 72d year. His chief writings are 'Systema Locorum Theologicorum' (12 vols., 1665–77); 'Biblia Illustrata' (4 vols.), defending the orthodox views of inspiration against Grotius.

CALOYERS (καλός, «beautiful,» «good»; and γέρων «an old man»), Greek monks belonging with a few exceptions to the order of Saint Basil, who lead a very austere life, eating no meat and observing the fasts of the Greek Church rigidly. They do not even eat bread unless they have earned it. During their seven weeks of Lent they pass the greatest part of the nights in meditation and grief for their own sins and those of others. The caloyers of the Greek Church occupy a position of much greater importance than the members of the religious fraternities of the Church of Rome, inasmuch as all the higher Church dignitaries — bishops, archbishops and patriarch — are chosen from their number. They are, indeed, the only individuals in the Greek Church who are instructed in theology, and even among them the amount of theological learning is very limited. They are commonly educated at the monasteries on Mount Athos, and on the isle of Patmos, but besides these there are many monasteries dispersed over the archipelago and the Morea, and a few elsewhere belonging to this class of monks. Their most celebrated monastery in Asia is at Mount Sinai. They do not all agree as to their mode of life. Some of them are cenobites; that is, they live in common. Others are anchorites, living alone, or with only one or two companions; and others again are recluses, who live in grottoes or caverns in the greatest retirement, and are supported by alms supplied to them by the monasteries. There are also convents of female caloyers. The Turks sometimes call their dervishes by this name.

CALPE, kăl'pē, the ancient name of the rock of Gibraltar (q.v.), at the southern extremity of Spain, the northern of the two hills called by the ancients the «Pillars of Hercules» (q.v.). Across the straits of Gibraltar, on the African coast, was Abyla, the southern pillar.

CALPEE. See KALPI.

CALPRENÈDE, kăl'prĕ'nĕd', **Gautier de Costes de la,** French romance writer: b. Tolgou, Gascony, 1610; d. Paris 1663. He was an officer of the guards and royal chamberlain, and one of the authors who in the 17th century brought into fashion a new kind of voluminous and long-spun romances of chivalry. He wrote 'Cassandra'; 'Cleopatra'; and 'Faramond,' besides 10 tragedies, among which are 'La mort de Mithridate' (1635); 'Jeanne d'Angleterre' (1636); 'Le Comte d'Essex' (1638). His romances were highly celebrated, and are the best of their kind. Consult Fourgeaud-Lagrèze, 'Le Périgord littéraire; La Calprenède' (Ribérac 1877); Morillot, 'Le roman en France' (Paris).

CALPURNIA, the fourth wife of Julius Cæsar, married to him 59 B.C. She was a daughter of L. Calpurnius Piso Cæsonius, who was consul 58 B.C. Shakespeare introduces her into his tragedy, 'Julius Cæsar.' The name is also that of the daughter of L. Calpurnius Bestia, wife of P. Antistius, who took her own life when she learned that her husband was slain by order of the younger Marius, 82 B.C.

CALPURNIUS, Titus, surnamed **Siculus,** Latin poet: b. about 30 A.D.; d. about 80. Seven eclogues composed by him are extant, but nothing whatever is known with certainty about his life, and even his name is doubtful. The poems attributed to him are evidently modeled on Virgil's more famous eclogues. They are exaggerated and artificial. They have been edited by Schenkl (Leipzig 1885), and Keene (London 1887), and translated by Scott (London 1890). Consult Butler, 'Post-Augustan Poetry' (pp. 150–59, Oxford 1909). See NEMESIANUS.

CALTANISSETTA, kăl-tạ-nē-sĕt'tạ, Sicily, capital of the province of the same name, on the right bank of the Salso, 62 miles southeast of Palermo. It is fortified, and has a citadel and cathedral, with paintings of the later Sicilian school, public gardens, a seminary, a gymnasium, a school of technology, broad streets and well-built houses. In the vicinity, at Terra Pilata, are springs of petroleum and of hydrogen gas, a mud-volcano and important sulphur mines, producing annually about 5,500 tons. In the neighborhood there still stands a Norman monastery built by Roger II in 1153. Caltanissetta owes its origin to the Saracens, by whom it was called *Kalat al Nisa* («the lady's castle»). The province of the same name has an area of 1,445 square miles. Pop. 40,297.

CALTHA, the genus of ranunculaceous plants to which the marsh-marigold (*C. palustris*) belongs. See COWSLIP.

CALTROP, a kind of thistle growing in southern Europe. It is armed with prickles, which, if trodden on by men or animals, are capable of wounding. Hence in the military art the name of caltrop is given to an instrument with four iron points disposed in a triangular form, three of them being turned to the ground and the other pointing upward. They are used to impede the progress of cavalry.

CALUMBA or **COLOMBO**, the root of *Jateorrhiza columba*, an herbaceous plant, belonging to the family *Menispermaceæ*, which grows in Ceylon in the neighborhood of Colombo, whence it is said to derive its name. It is imported in the form of round slices or cut pieces, the interior of which is of a greenish-yellow color, while its thick and furrowed skin is greenish-brown; its odor is slightly aromatic, but somewhat nauseous; its taste extremely bitter. Calumba is often administered as a tonic, and is considered an excellent stomachic. It is regarded as of great value in chronic diarrhœa and dysentery; but it is necessary that all symptoms of inflammation should have disappeared before it can be used. It is usually given as a decoction, less commonly in the form of pills or powders. The root of an American gentian, *Frasera carolinensis*, is sometimes substituted for the true calumba, and is hence frequently called the false calumba. It is not very bitter, and is almost without smell; it has no very marked effects.

CALUMET, Mich., township in Houghton County, at the terminus of the Mineral Range Railroad, 42 miles north of L'Anse and 68 miles northwest of Marquette. It is the seat of the famous Calumet and Hecla copper mine, the richest in the world, producing nearly 50,000 tons a year. It is the trade and supply centre of the Superior mining district, and has a national bank, several weekly newspapers, manufactories and an assessed property valuation of over $26,000,000. A $10,000,000 water-power project on the Sturgeon River, 15 miles to the south now completed, affords cheap freight rates to a large number of industrial plants, elevators, and coal docks. Commerce in a recent year amounted to 6,549,576 short tons, consisting of coal, grain, iron ore and merchandise, valued approximately at $162,000,344. Pop. about 33,000.

CALUMET, the pipe of peace, a tobacco-pipe used by the North American Indians. On ceremonial occasions, as when Indian chiefs and warriors meet in peace, or at the close of a war with those of another nation, in their talks and treaties with the whites, or even when a single person of distinction comes among them, the calumet is handed round with ceremonies peculiar to each tribe, and each member of the company draws a few whiffs. To accept the calumet is to agree to the terms proposed; to refuse it is to reject them. Some symbols of amity are found among all nations; the white flag or flag of truce of the moderns and the olive branch of the ancients are similar in character to the Indian calumet. There is also, it appears, a calumet used in the ceremonial declaration of war and differently made from that of peace. Tobacco is smoked in the calumet, and the leaves of various other kinds of plants. The bowl of this pipe is made of different kinds of soft stone, especially of a kind of red soapstone, and the stem of a reed, or of some light kind of wood which is easily perforated. This stem is adorned in various ways; sometimes it is marked with the figures of animals and hieroglyphical delineations, and almost universally has beautiful feathers attached to it, disposed according to the taste of the individual or of the tribe to which he belongs.

CALUMPIT, Philippines, a town of the province of Bulacan, situated in the southwestern part of the island of Luzon on the Pampanga River. It is about 27 miles northwest of Manila, with which it is connected by rail. Pop. about 15,000.

CALVADOS, kal'vă'dōs', France, a northern maritime department, bounded on the north by the English Channel, and east and west and south by the departments of Eure, Manche and Orne. The soil is generally fertile, supplying wheat, barley, oats and rich pasturage for cattle, sheep and horses, which, with swine, constitute the principal wealth of Calvados. Fishing is also a thriving industry. Calvados is named for its cider. The climate is healthful, though changeable. Iron, marble, slate and coal are found. The area is 2,198 square miles. It is so called from Calvados, corruption of 'Salvador' the name of a vessel of the Spanish Armada, which was wrecked on the coast here. Capital, Caen. Pop. 396,310.

CALVAERT, käl'värt, **Dionys** (called in Italy Dionisio Fiammingo), Flemish painter: b. Antwerp 1555; d. Bologna, Italy, 17 March 1619. He went very young to Italy as a landscape painter, where, in order to learn how to draw figures, he entered the school of Fontana and Sabbatini, in Bologna, with the latter of whom he visited Rome. After having passed some time in copying the paintings of Raphael, he opened a school at Bologna, from which proceeded 137 masters, and among these Albano, Guido and Domenichino. The Bolognese regarded him as one of the restorers of their school, particularly in respect to coloring. Calvaert understood perspective, anatomy and architecture; but the attitudes of his figures are sometimes mean and exaggerated. His best paintings are to be seen at Bologna and others are to be found in England, Dresden and Vienna.

CALVARY, the English name for the eminence, which was the scene of the crucifixion of Jesus Christ. It lay beyond but near Jerusalem, and by some it is identified with the old House of Stoning, or place of public execution, according to the law of Moses, on the top of the remarkable knoll outside the Damascus gate, on the north side of Jerusalem. It was from this cliff that the criminal used to be flung before being stoned (according to the Talmud), and on it his body was afterward crucified; for the spot commands a view all over the city, and from the slopes round it the whole population might easily witness the execution. In Roman Catholic countries the name is applied to the representation of the passion and crucifixion, by three crosses, with life-size figures of Christ and the thieves and a number of surrounding figures, representing the mob present at the crucifixion. The Calvary at Aix-la-Chapelle is represented by a church on a hill, around which are 12 stones, with sculpture marking the events which occurred on the journey of Jesus to Mount Calvary. The road leading to Calvary is called 'Via Dolorosa.'

CALVÉ, kăl'vā, **Emma**, French opera singer: b. Madrid, Spain, 1864. Her real name is Emma de Roquer. She was born of a French mother and Spanish father, and was educated in a convent school in the south of France. She studied under Rosine Laborde and made her début at Brussels in Gounod's 'Faust,' 1882. She has made successful tours of the United States in leading rôles, her first appearance in New York being on 29 Nov. 1893; and has been popular in opéra comique and grand opera in Europe. Some of her best rôles are 'Chevalier Jean' (1885); and Massenet's 'Navarrise' (1895). After 1909 she devoted herself to concert tours.

CALVERLEY, Charles Stuart, English poet and humorist, son of the Rev. Henry Blayds: b. Martley, Worcestershire, 22 Dec. 1831; d. London, 17 Feb. 1884. In 1852 his father dropped the name of Blayds and resumed that of Calverley, formerly borne by his family. He was educated at Christ's College, Cambridge, and during his college career showed great skill in Latin and Greek composition, in 1856 was second in the classical tripos and was appointed fellow in 1858. As a writer of humorous English verse he also made himself famous. He afterward studied for the bar, and was called in 1865, but his promising legal career was cut short by a serious accident which befell him on the ice in the winter of 1866–67. The effects of this misfortune clouded the whole of the remainder of his life. As a parodist and writer of light verses Calverley is perhaps unequaled, but his published volumes are not numerous. The earliest of them appeared in 1862 under the title of 'Verses and Translations'; and the others are 'Translations into English and Latin' (1866); 'Theocritus Translated into English Verse' (1869); 'Fly Leaves' (1872); and 'The Idylls of Theocritus and the Eclogues of Virgil Translated into English Verse; with an Introduction by R. Y. Tyrell' (London 1908). A 'Memoir and Literary Remains' were published by Sendall (London 1885).

CALVERT, George. See BALTIMORE FAMILY.

CALVERT, George Henry, American writer: b. Baltimore, Md., 2 Jan. 1803; d. Newport, R. I., 24 May 1889. He was a great-grandson of Lord Baltimore. After graduating at Harvard in 1823 he studied in Göttingen; then returning to Baltimore, became editor of the *American* and a contributor to various periodicals. In 1843 he removed to Newport, R. I., of which city he was elected mayor in 1853. His published books include 'Illustrations of Phrenology' (1832); 'Poems' (1847); 'Joan of Arc' (1860); 'Goethe, his Life and Works' (1872); 'Brief Essays and Brevities' (1874), and 'Wordsworth: a Biographic Æsthetic Study' (1875); 'Three Score and Other Poems' (1883). He translated the correspondence of Schiller and Goethe (1845) and Schiller's 'Don Carlos' (1836).

CALVERT, Leonard. See BALTIMORE FAMILY.

CALVI, kăl'vē, **Lazzaro** and **Pantaleone**, Genoese painters, sons of Agostino Calvi: the former b. 1502; d. 1606; the latter d. 1595. They painted in concert many pictures in Genoa, Monaco and Naples. In particular, the façade of the Palazzo Doria (now Spinola), a spirited composition crowded with figures, is highly extolled. Lazzaro was the more inventive genius of the two, his brother generally working out the details of their joint productions.

CALVIN (modified from the French form Cauvin or Caulvin), **John**, Swiss reformer of the 16th century: b. Noyon, Picardy, 10 July 1509; d. Geneva, Switzerland, 27 May 1564. Though born in humble condition, his father, as procureur-fiscal of the district of Noyon and secretary of the diocese, was able by personal influence to further the interests of his family. Calvin's mother, Jeanne Lefranc, was distinguished alike by personal beauty and piety. Even as a lad Calvin was deficient in physical vigor, but gave early tokens of more than ordinary intellectual powers, a circumstance that attracted to him the regards of a noble family at Noyon who received him under their care and gave to him the same opportunities of schooling as were enjoyed by their own children (1523). It was his father's original intention to fit him for the priesthood and in pursuance of that object he was sent to the Collège de la Marche at Paris; then to the Collège Montaigu where he was trained in logic by a learned Spaniard who afterward directed the education of Ignatius Loyola while a student at the same school. He easily stood in the front rank of his fellow-students but was little disposed to affiliate with them, and from a certain unsocial severity of bearing acquired among them the nickname of the «Accusative Case.» At the age of 12 he received part of the chapel revenue of Noyon in return for some services there. In 1527 his father secured for him the curacy of Saint Martin de Martinville, from which he resigned in 1529, in favor of his younger brother, and in the same year exchanged the curacy for that of Pont l'Evêque, his father's birthplace.

Then his father changed his plans with reference to John and determined to have him prepared for the profession of law, putting him for that purpose under instruction at Orléans (1528), where he studied with Pierre d'Etoile and Bourges (1530), where he applied himself to his studies with the same assiduity evinced at Paris, and attained immediate distinction, though at the expense of impaired health. Without confining himself strictly to the curriculum of the school he devoted himself at the same time to the study of Greek under the German professor, Melchior Wolmar, whose Protestant views strengthened the bias toward the new faith already existing in his pupil's mind, for his attention had previously been drawn to the careful study of the Scriptures by his kinsman Olivetan, the first Protestant translator of the Bible into French. When Calvin was 22 his father died, whereupon the young man gave up his law studies and returned to Paris, where he met Lefèvre and Farel, studied theology, issuing soon after his first publication, an annotated edition of Seneca's 'De Clementia.' Up to this point it is safe to presume that his interests and ambitions were purely those of a humanist, and whatever thought he may have had in regard to the need of reform in the matters of Church doctrine and discipline, he doubtless felt with Erasmus and Reuchlin that all the reforms that might be required would come about as the result of completer knowledge.

It was not long after this that he experienced what he calls his “sudden conversion.” He writes: “After my heart had long been prepared by the most earnest self-examination, on a sudden the full knowledge of the truth, like a bright light, disclosed to me the abyss of errors in which I was weltering, the sin and shame with which I was defiled.” His experience is near of kin to that of Luther, and we are set thinking also of the “great light” that shone upon Saul as he was nearing Damascus. Yet with all the profound disclosure thus made to him, he still felt no special call to the work of preaching the reformed doctrine and sought only for the undisturbed retirement that would permit him farther prosecution of his serious studies.

His friend Nicholas Cop had been elected to the rectorship of the University of Paris and at his request Calvin prepared for him an inaugural address which was substantially a defense of the reformed doctrine (1533). To the Sorbonnists this was intolerable, and Calvin was obliged to escape. He returned for a while to his native place, resigned the preferment he held in the Roman Catholic Church and for nearly three years led a wandering life. We find him at Saintonge; at Nérac, the residence of the Queen of Navarre; at Angoulême, with his friend Louis Tillet; then in Paris again. To escape persecution in France, he fled to Basel, where in 1536, at the age of 26, he published his “Institutes.” This remarkable work was intended to be a vindication of the Protestant doctrine, and its dedication to the reigning king, Frances I, sought to create royal sympathy for the cause and for its persecuted adherents. It has been claimed that no other work, written at so early an age, has produced such a marked influence upon the opinions and practices both of contemporaries and posterity. Although the book as then composed was but the germ of what it was subsequently developed into, yet the line initially laid down in it Calvin never swerved from. By his Catholic opponents his work was styled the “Koran of the heretics.”

After completing this work he went for a short time to Italy to visit Renée, the Duchess of Ferrara. Finally he made a visit to his native town; and after selling the paternal estate, which had devolved on him at the death of his eldest brother, set out with his brother and sister for Strassburg. The direct road being dangerous, they went through Geneva. The situation, political and religious, which he there confronted, however, vetoed his plans and really determined his entire subsequent career. That situation briefly outlined is as follows: The Duke of Savoy, unable to secure the submission of Geneva, had by the aid of Pope Leo X forced upon the city the reluctant acceptance of John, the Bastard of Savoy, as bishop, it being stipulated that the civil administration of the city should be vested in the Duke. The Genevese revolted under the lead of Berthelier and Bonnivard, but were defeated, Berthelier was executed and Bonnivard became the “Prisoner of Chillon” (1530–36). Defeat did not, however, extinguish the spirit of revolt. Of the two parties into which the Genevese were divided, the Confederates (“Eidgenossen,” a word from which perhaps comes the word Huguenot) looked for relief to the Swiss, and the Mamelukes favored supporting the Duke. The Confederates prevailed, the Duke was worsted and all power both military and civil passed into the hands of the people. This was in 1533.

To this civil overturning succeeded an ecclesiastical revolution. Protestant tendencies had established themselves in Bern, and from there had extended themselves to Geneva. The struggle in the latter place was a severe one, but Protestantism gained ground till under the leadership of Farel and with the assistance of Bern an ecclesiastical reconstruction was effected, the bishop driven out, Protestantism established and Geneva left independent. This meant not only a new form of doctrine and mode of worship, but a reformed system of morals, and thereby a strain put upon the large profligate element of the population that soon worked a reaction strenuously encouraged by the Savoyards and the Catholic priests. The entire city was in this way wrought into a condition of tumultuous faction, and it was just in the midst of this warring of civil, moral and ecclesiastical elements that Calvin arrived at Geneva as already stated, and took lodgings for the night with the distinct intention of going on to Basel the next day. Farel, who was in charge of the Protestant movement, learned of Calvin's presence in the city, through Louis du Tillet, got into communication with him and in an interview graphically described by Calvin in the preface to his ‘Commentary on the Psalms’ (a work especially rich in autobiographical references), entreated him to remain and help work out the problem of Protestantism in Geneva, denouncing upon him the curse of God if he refused. Calvin was awe-stricken by what seemed to him the prophetic deliverance of Farel and yielded to his Elijah-like expostulation, so that the dictum is well justified that “Farel gave Geneva to the Reformation and Calvin to Geneva.”

He prefaced his work in Geneva by introducing and setting in operation a system of stringent regulations relative to doctrine, discipline and daily conduct. Amusements like dancing and card-playing were punishable offenses, not because in his judgment inherently wrong, but because so abused that the only safe course was to prohibit them altogether. The stringency of this policy excited a revolt led by the Libertines, so styled, and participated in even by many of the same “Eidgenossen” that had helped wrest Geneva from the grasp of the Duke. The opposition culminated in an act of Council expelling Calvin and Farel from the city (1538), the latter going to Neuchâtel, and Calvin to Strassburg, where, with a sense of relief, he thought to find himself free to gratify his tastes and resume his studies. Here again, however, as at Geneva, he was stirred by an intimidating call and applied himself to the work of ministering to the French refugees there gathered. It was during his stay in Strassburg that he married a lady of admirable character, Idelette de Bure, widow of Jean Strodem of Liége, with whom he lived in relations of tender attachment till her death nine years later, their only child, a son, dying in early infancy.

In Geneva, in the meantime, matters had been going from bad to worse, till by the united voice of government and people Calvin was called. Crime and vice had become rampant. Catholics were planning for the restoration of the old faith. Cardinal Sordelet had addressed to the people a flattering and cajoling letter calculated to win them back to the Catholic Church. To that letter Calvin while still in Strassburg had published a reply both sagacious and masterly. Bern was suspected of having ambitious political designs on the city. The local government was too weak to maintain itself amid such a storm of conflicting elements and so after three years the people turned again helplessly to the man they had exiled. He fought against the overtures tendered him but was overborne by their earnestness and unanimity and came back to Geneva to make there his life-long home (1541).

Calvin entered at once upon his office of administrative head of the city, considered in both its ecclesiastical and civic character. Though combining the two in his own person he was no Erastian, and Church and State stood to him as theoretically distinct, and yet contributing, each, to the interests of the other, the Church infusing its spirit into the State and the State in turn furnishing authoritative support to the Church. Civil authority, previously widely distributed, he made more oligarchic and vested it primarily in what was known as the «Little Council of Twenty-five.» The code devised for the city bears everywhere the marks of Calvin's authorship. For this his legal training especially qualified him. Larger and smaller matters alike came under his purview. Like the English Alfred the Genevese legislator braced his system of enactments by a liberal infusion of the Mosaic letter and spirit. Ecclesiastical discipline was delegated to the Consistory, composed at first of 18 members, 6 clerical and 12 lay, with Calvin as its president. The city was divided into districts or parishes and a system of vigilance so thoroughly organized that every family was at least once a year visited by responsible parties for purposes of censure, counsel or relief.

Although introducing his administration with a measure of moderation, its animus soon evinced itself in a way that made evident to the lawless and vicious classes what it was they had to contend with, and a wide-reaching opposition began immediately to organize itself. This opposition included the Libertines and the «Patriots,» which latter class bitterly opposed the close aristocratic lines with which the previous popular government had been replaced and regarded with jealousy the foreigners that in great numbers were coming to make their home at Geneva. The enmity toward him and his administration was still further fomented by the irrational and merciless severity shown in the punishment of small offenses, such as the beheading of a child for striking its mother, the committal of heretics to the flames, the eliciting of testimony by torture. His rule was one of terror and he was both feared and hated. Mobs attempted to intimidate him. Dogs in the street were named after him. To antagonize Calvin was a crime, as Castellio found to his cost, and to speak disrespectfully of predestination, as did Bolsec, a felony. But cases like these two are quite eclipsed by the instance of Servetus.

Servetus was a Spaniard, a scholar of independent thought, who convinced himself of the groundlessness of papal claims, but without cordially accepting the theology of Protestantism. In 1531 he published a book entitled 'The Errors of the Trinity.' Irritated by Calvin's treatment of him and his speculations he retorted upon him and the Reformed doctrine flatly and acrimoniously. Though out of sympathy with the Roman Catholic Church Servetus continued for 20 years in outward conformity with its doctrine and discipline and then wrote another volume under the title 'The Restoration of Christianity.' This was issued by him during his residence at Vienne and resulted in his arrest at the instance of the archbishop. A copy of the work came under Calvin's eye, who declared that if Servetus were to come to Geneva he should not get away alive if his authority was sufficient to prevent it. Having escaped from Vienne Servetus did come to Geneva, where his presence soon reached the knowledge of Calvin, who ordered his arrest. Thirty-eight heretical propositions were alleged against him, among others the rejection of the Trinity and speculation leaning toward pantheism; and, although he conducted his defense with vigor and with a degree of acuteness, he was condemned and, to the disgrace of the Protestant cause, was burned a little way out from Geneva on 27 Oct. 1553. It is claimed in behalf of Calvin that he tried to mitigate the severity of the penalty. However that may be, he was set on pursuing Servetus to the death, and it is on record that he wrote as follows to Farel two months before the execution,—«I hope the sentence will be capital but desire the atrocity of the punishment to be mitigated.» It has to be remembered however that all of this was in keeping with the barbarism of the age and that so gracious-spirited a man as Melancthon gave to it his assent. After the execution of Servetus and the expulsion of the Libertines two years later, Calvin's power in Geneva was firmly established. He used his influence vigorously for the defense of Protestantism throughout Europe. By the mediation of Theodore de Bèza he made his influence felt in France in the great struggle going on there between the hierarchical party with the Guises at its head and the Protestants led by Condé and Coligny. In 1561, his energies began to fail, and after much bodily suffering, he died.

During the entire course of his conflict with heresy and the Libertines, Calvin was actively engaged in preaching and lecturing. He had crowds of hearers from all parts of Europe. Protestant refugees were in attendance upon his lectures and discourses and went back carrying with them the impression made upon them by his doctrines and personality. Thus was he able to stamp himself ineffaceably upon the religious thought of his own and aftertimes, and to cause Geneva to sustain to the Latin nations in particular a relation similar to that subsisting between Wittenberg and the Germanic. The weight and permanence of the influence he exerted was due partly to his own idiosyncrasies. Both his mode of thinking and his policy of action were measurably determined by his natural temperament and his physical debility. He was composed principally of will and brain, with too little of the tenderer sensibilities to sweeten the action of the one or to rectify the aberrations of the other. Naturally enough then he made the doctrine of God's sovereignty the keystone of his system, and could conceive of heresy as being none other than the unpardonable sin. The same combination of volitional and intellectual genius made him also a born organizer, enabling him to compact and mature the reform tendencies of the times into a corporate whole where before everything had been incipient and sporadic.

Calvinism is Augustinianism in its developed and Protestant form, the two theologians coinciding in their views of predestination, sin and grace, though differing in the matter of justification and other less important matters. The keynote of Calvinism is not predestination, as is sometimes claimed, but divine sovereignty, out of which, understood as Augustine and Calvin understood it, predestination issues as a necessary corollary. Predestination so derived carries with it perforce the notion that those who are elected to be saved are so elected by the arbitrary action of the divine will;—«He hath mercy on whom he will have mercy, and whom he will he hardeneth.» The motive therefore leading to God's exercise of grace in specific cases has its inexplicable grounds in the mind of God, and is nowise referable to any condition existent in the sinner. «Infralapsarianism,» «Permissive Decree,» etc., are merely philosophical attempts to relieve divine arbitrariness from the charge of immorality.

Among Calvin's most important works are ‹Christinæ Religionis Institutio› (1536); ‹De Necessitate Reformandæ Ecclesiæ› (1544); ‹Commentaires sur la concordance ou harmonie des Evangelistes› (1561); ‹In Novum Testamentum Commentarii›; ‹In Libros Psalmorum Commentarii›; ‹In Librum Geneseos Commentarii.› The first edition of Calvin's whole works is that of Amsterdam (1671, 9 vols. fol.), but this has been superseded by the definitive and critical edition begun by J. W. Baum, E. Cunitz and E. Reuss, and finished by Lobstein and Erichson (59 vols., Brunswick and Berlin 1863–1900). By the Calvin Translation Society, his works have been collected, translated into English and issued in 51 volumes (1843–55). Consult for biography Beza, T. de (Geneva 1564, new ed., 1869), the original life, written a few months after Calvin's death; Bolsec, J. (Lyons 1577; new ed., 1875), written from the Roman Catholic standpoint; Henry, P. (3 vols., Hamburg 1835–44), English translation abridged and altered by Stebbing (London 1851); Dyer, T. H. (London 1850); Bungener, F. (Paris 1863, English trans., Edinburgh 1863); Staehelin, E. (Elberfeld 1863); Pierson, A. (Amsterdam 1883–91); Walker, W. (New York 1906); all of which are written from a Protestant point of view. A very impartial and valuable book from a Roman Catholic is that by Kampschulte, F. W., ‹Johann Calvin, seine Kirche und sein Staat in Genf› (Leipzig 1869–99). An exhaustive work is that by Doumergue, E. (Lausanne 1899–1908), containing many original drawings, facsimiles, etc., and is the work of a lifetime. For detailed history of the life of Calvin, consult d'Aubigné, Merle, ‹History of the Reformation in Europe in the Time of Calvin›; Fisher, G. P., ‹The Reformation›; Schaff, Philip, in ‹History of the Christian Church› (Vol. VII, pp. 257–844, New York 1892); article on «Calvin» in the ‹Schaff-Herzog Encyclopedia of Religious Knowledge.› A very complete bibliography is given in Schaff's ‹Creeds of Christendom.› See INSTITUTION OF THE CHRISTIAN RELIGION.

CHARLES H. PARKHURST.

CALVINISM. The system of religious thought taught by John Calvin, which maintains that God is the sovereign ruler of the world and every good thought comes directly from him. The conception of the sovereignty of God did not originate with Calvin; it is as old as the Hebrew writings; but he emphasized it in such a way that it impressed itself upon the religious thought of his day and has continued to be the conception of God held by all Christian denominations and by many of whom it is made such a cardinal belief that the possibility of doubting it is not even brought into question. The dominant features of Calvinism impressed themselves upon his followers so thoroughly that they became a moving power in the lives of vast masses of people. Calvin followed the belief in predestination to its logical conclusion and he proclaimed that some were born to life and some to damnation; he taught that regeneration could be obtained only through the spirit of God acting upon the human heart; that God will keep to the path of righteousness only those to whom he has given regenerating grace, and that he who is elected will continue in the way of righteousness. Calvinism emphasizes the unchangeable nature of God, his never-dying love and his justice; for the manifestation of these, his great and glorious attributes, he created the world and all that is thereon. He foreordains everything that comes to pass; and the world moves forward according to his plans. Calvinism lays stress upon election, redemption, bondage of will, grace and the pereseverance of the saints. According to Calvinism the fall of man was predestined, and all descendants of Adam have ineherited his sin and the accompanying punishment.

All Calvin's religious beliefs are logically stated and developed in his ‹Institutio Christianæ Religionis›; but, with all his care, he left certain questions unanswered; and these have divided his followers into two camps or schools, the «Supralapsarian» and the «Infralapsarian,» who differ principally on the order of the divine decrees. The former looks to the final result, as the first thing contemplated in these decrees; while the latter tries to soften the pronounced theory of predestination by having God permit man to fall. This softened form of predestination is the one generally accepted by Calvinists. (See CALVIN, JOHN). Consult Bright, ‹Select Anti-Pelagian Treatises of St. Augustine› (London 1880); Calvin, ‹The Institutes of the Christian Religion› (Philadelphia); Hodge, A. A., ‹Commentary on the Westminster Confession of Faith› (Philadelphia 1869); Kuyper, A., ‹Calvinism, The Stone Lectures› (New York 1898).

CALVINISTIC METHODISTS, a section of the Methodists in Great Britain, distinguished by their Calvinistic sentiments from the ordinary Wesleyans, who are Arminian. Wesley and Whitefield, the colleagues in the great evangelistic movement in the 18th century, differed with regard to the doctrines of grace, Wesley being Arminian, and Whitefield Calvinistic. Whitefield may be regarded as the founder of Calvinistic Methodism. Other names, and especially that of Howell Harries, of Trevecca, should be mentioned in connection with it. In its distinctive form it dates from 1725, but did not completely sever its connection with the Church of England till 1810. In government it is now Presbyterian. Its great seat is Wales and it is claimed as the only denomination in Wales of purely Welsh origin. The Calvinistic Methodists exist in three divisions: the Whitefield Connection, 1741; Countess of Huntingdon's Connection (Huntingdonians) 1748; Welsh Methodists, 1750.

CALVO, käl'vō, **Carlos**, Argentine jurist and author: b. Buenos Aires, 26 Feb. 1824; d. Paris 1906. On 25 June 1860 he was accredited to the courts of Paris and London as minister plenipoteniary, and resigned after having fulfilled his special mission. In 1885 he became Argentine Minister at Berlin. In 1869 he was elected a corresponding member of the Paris Academy of Moral and Political Sciences, and later received the decoration of an officer of the Legion of Honor. He wrote numerous works, the most important of which are 'Complete Collection of Treaties, Conventions, and Other Diplomatic Acts of All the Latin-American States' (15 vols., 1862–69); 'Historical Annals of the Revolution in Latin America' (5 vols., 1864, and late dates); 'International Law in Theory and Practice' (2 vols., 1870–72; 5th ed., in 6 vols., Paris 1896), a work considered by jurists as one of the most remarkable on its subject; 'Study on Emigration and Colonization' (1875); 'Dictionary of Public and Private International Law' (2 vols., 1885); 'Manual of Public and Private International Law' (3d ed., 1892). The «Calvo Doctrine,» advanced by him, provided that the collection of pecuniary claims made by citizens of any country against the government of another country should never be made by force. Practical application of that doctrine to crises that arose subsequently was urged by the Argentine Minister for Foreign Affairs, Dr. Luis Maria Drago (q.v.), whose name has therefore been associated with South and Central American protests against the employment of foreign naval or military forces to coerce debtor nations on those continents.

CALVUS, Gaius Licinius Macer, Roman orator and poet, a son of the annalist and orator of the same name: b. 82 B.C.; d. about 47. He left 21 orations, but few fragments survive. One of these, against Vatinius, whose counsel Cicero was, produced so powerful an effect that the accused interrupted the orator and exclaimed, «Judges, am I to be condemned because my accuser is eloquent?» His poems were ranked with those of Catullus. He is often praised by Cicero (Brutus, 280–85; Ep. ad. Fam., 15, 21). The fragments of Calvus's writings have been collected by Plessis (Paris 1896).

CALX, properly lime or calk (hence «calcareous earth»); but the term is more generally applied to the residuum of a metal or mineral which has been subjected to violent heat, burning or calcination, solution by acids or detonation by nitre, and which is or may be reduced to a fine powder.

CALYCANTHUS, a genus of plants of the family *Calycanthaceæ*. Four species of American fragrant shrubs, often grown for ornament. *C. floridus* and *C. fertilis* are found in the Alleghany Mountains from Pennsylvania southward; *C. occidentalis*, in California. They are popularly known as sweet-scented shrub and Carolina or American allspice. The leaves are green and rather large, and the flowers usually some shade of chocolate or purple; both are sweet-scented. In the northern United States the species are scarcely hardy, though some thrive in the vicinity of New York city upon well-drained, rather rich soil in somewhat sheltered situations.

CALYDON, an ancient city of Ætolia, celebrated in the stories of King Œneus, the Calydonian boar and Dejanira and Hercules. The Romans, according to their measurement, placed it at seven and one-half miles from the Ionian Sea on the river Evenus. The heroes, Meleager, Tydeus lived there. In the reign of Augustus 31 B.C. the inhabitants were moved to the city of Nicopolis which was founded to commemorate the victory of Actium. Recent explorations point to the site of the city at Kastro of Kurtagá on the Evenus.

CALYDON, Forest of, a large forest mentioned in the Arthurian legends; it is supposed to have been in the northern part of England, or it may have been the wooded portion of the midland counties, which include also the «Sherwood» of Robin Hood.

CALYDONIAN BOAR, in Greek mythology, a boar sent to lay waste the fields of Œneus, King of Calydon, the ancient capital of Ætolia, when he omitted a sacrifice to Artemis. The goddess sent the boar when Œneus was absent on the Argonautic expedition. No one dared to face the monster, until Meleager, the son of Œneus, with a band of heroes, pursued and slew him. The Curetes laid claim to the head and hide, but were driven off by Meleager. Later accounts make Meleager summon to the hunt heroes from all parts of Greece, among them the maiden Atalanta, who gave the monster the first wound. This hunt is often found in Greek art. The best known is in the pediment of the Temple of Athena Alea at Tegea by the great sculptor, Scopas, some fragments of which are now in Athens. Consult Gardner, E. A., 'A Handbook of Greek Sculpture' (pp. 378–81, London 1911).

CALYMENE, kăl-ĭ'mē-nē, a genus belonging to the fossil order of the trilobites, characteristic of the lower and middle Ordovician formations of the Lower Silurian strata of Europe. In this genus the head is almost semicircular and deeply divided by longitudinal furrows. The eyes are situated on the lateral lobes. The rings of the thorax and abdomen are difficult to distinguish from each other. The thoracic segments are from 10 to 14 in number. The abdominal rings are distinct and never attached to each other. The genus includes about 20 species, of which the *Calymene Blumenbachii* may be taken as the type. The members of this genus have the power of rolling themselves up like a ball.

CALYPSO, in Greek mythology, a daughter of Atlas (some say of Nereus and Doris, or of Oceanus and Thetis). She inhabited the woody island Ogygia situated deep in the ocean, and lived remote from all intercourse with gods and men. She rescued the shipwrecked Odysseus and kept him with her seven years; but though she promised him immortality, she was unable to stifle his desire to return to Ithaca. At the command of Zeus, brought by Hermes, she allowed him to depart on a raft of his own making. Grief for his departure brought about her death.

CALYPTRA, the hood of the theca or capsule of mosses. The same name is given to any hoodlike body connected with the organs of fructification in flowering plants.

CALYPTRÆA, a genus of gasteropod mollusks belonging to the family of the *Calyptræidæ*, resembling limpets in certain characteristics, but differing from them in structure. This genus consists of small marine shellfish, conical in form, but sometimes very flat; they are fragile, and are distinguished by a conical shell or testaceous process attached to the bottom of the cavity of the shell. The branchiæ of this mollusk are composed of long and thin hairlike filaments. It is sometimes found as a fossil.

CALYPTREIDÆ, a family of limpets, including those called slipper limpets or cup-and-saucer limpets. See LIMPET.

CALYX, in botany, the exterior covering of a flower; that is, the outermost floral envelope consisting of a circle or whorl of leaves external to the corolla, which it encloses and supports. The parts or leaves which belong to it are called sepals; they may be united by their margins, or distinct, and are usually of a green color and of less delicate texture than the corolla. In many flowers, however (especially monocotyledons), there is little or no difference in character between calyx and corolla. In some groups of plants the calyx is wanting.

CAM, kän, **Augustus Nicolas,** French sculptor: b. Paris 1822. He was a pupil of Rude; his first works represent small animals, but he later chose the large beasts and birds of prey for his subjects. Among his best-known works are ‹Linnets Defending Their Nest Against Rats›; ‹Tiger in Conflict with a Crocodile›; and ‹Eagle and Vulture Wrangling over the Carcass of a Bear.›

CAM, kän, or **CAÕ,** kän, **Diogo,** Portuguese explorer of the 15th century, who followed up the course of Prince Henry of Portugal, sailed along the west coast of Africa, and in 1484 discovered the mouth of the Kongo, near whose bank an inscribed stone erected by him as a memorial was found in 1887. He then continued on to Cape Cross, where he also left a pillar dated 1485. This monument is now at Kiel, and three others which he erected are in the museum of the Lisbon Geographical Society. On Cam's return from his first voyage, his sovereign, Joan II, ennobled him (April 1484). He established Christianity in one of the Kongo states.

CAM, kăm, an English river formed by the junction of two streams, one of which (the Granta) rises in Essex and flows northwest, while the other (the Rhee) rises in the north of Hertfordshire, and flows northeast. The united stream flows sluggishly northward through Cambridgeshire, and falls into the Ouse some four miles south of Ely after a course of about 40 miles. The university town of Cambridge is situated on its banks a few miles below the confluence of the head-streams. It is navigable to Cambridge and is famous in connection with the boating races of the students of Cambridge University.

CAM, in machinery, a simple contrivance for converting a uniform rotary motion into a varied rectilinear motion, usually a projecting part of a wheel or other revolving piece so placed as to give an alternating or varying motion to another piece that comes in contact with it and is free to move only in a certain direction.

CAM AND ISIS, a familiar couplet by which the sister universities of Cambridge and Oxford are often mentioned. The allusion is to the rivers on which they are situated.

> "May you, my Cam and Isis, preach it long;
> The right divine of kings to govern wrong."
> POPE, "The Dunciad."
>
> "The drooping Muses, (Sir Industry,)
> Brought to another Castalie,
> Where Isis many a famous nursling breeds
> Or where old Cam soft passes o'er the lea,
> In pensive mood."
> THOMSON, "Castle of Indolence."

CAMAGUEY, Cuba, (formerly PUERTO PRINCIPE), (1) town, capital of the province of Puerto Principe, 170 miles northwest of the city of Santiago de Cuba. It was originally founded in 1515 at Nuevitas, the site of an old Indian village, on the northern coast, but was moved to its present site in 1516. For a time after 1800 it was the seat of government for the Spanish West Indies, and until the end of Spanish rule was an important military post. It is the largest inland city of the island, and is connected with its port, Nuevitas, by railroad. It is the centre of a cattle-raising district, and exports cattle, hides, etc.; sugar also is cultivated somewhat in the vicinity and exported. The town is very mediæval in appearance, the streets are narrow and the houses old; during the American occupation artesian wells were bored to obtain a pure water supply, the streets were repaired, a good drainage system introduced and buildings for schools remodeled.

(2) Province, east of the centre of the island, bounded on the east by Oriente and on the west by Santa Clara; area, 11,000 square miles. The north of the province is mountainous, the most of the surface being high tableland affording excellent pasturage. The chief industry is cattle raising, which, though it deteriorated during the war, is being rapidly revived, and the number of cattle largely increased; the finest horses on the island are also raised here. The province is also well wooded, and lumbering is an important industry; the minerals include iron, copper and asphalt, all of which are mined to some extent, asphalt being of the most commercial importance. General agriculture is carried on mostly in the vicinity of the town of Puerto Principe, and its port, Nuevitas; sugar is the most important agricultural product. The province was a centre of the insurrectionary movement, and Cubitas in the northern part was the seat of the insurgent government in 1896–98. Camaguey is the second province of Cuba in size but is least densely populated.

CAMAIEU, kȧ'mȧ'yę, or **CAMAYEU**, a painting wherein there is only one color, and where the lights and shades are of gold, wrought on a golden or azure ground. When the ground is yellow the French call it *cirage;* when gray, *grisaille*. This kind of work is chiefly used to represent bas-reliefs. The Greeks called pieces of this sort *μονοχρώματα*. The word is also applied to a painting in two or three different colors, which, however, do not represent the natural colors of the objects depicted.

CAMAJUANI, kä-mạ-hwä'nē, Cuba, an inland city in the province of Santa Clara, about 20 miles from the north coast of the island. It has rail connection with the capital and other northern cities. Pop. about 5,000.

CAMALDOLITES, CAMALDULIANS, or **CAMALDUNIANS**, a religious order established in 1012 by Saint Romuald, a Benedictine of Ravenna and a member of the family of the dukes of Ravenna, in the valley of Camaldoli, near Arezzo, in the Apennines, and confirmed afterward by Pope Alexander II. They were originally hermits living in separate cells, but as their wealth increased the greater part of them associated in convents. They existed in Italy, France, Germany and Poland. In the 18th century there were five independent fraternities of them, which are here mentioned in the order of their foundation: (1) at Camaldoli; (2) at Murano in the Venetian territory; (3) on Monte Corona, near Perugia; (4) at Turin; (5) the French fraternity, the first establishment of which was that of Notre Dame de la Consolation. They all had in common white garments, and the austere rules of the Benedictines. The hermits wore beards, and had still more severe rules than the monks in regard to fasting, silence and penances. Their life was devoted to contemplation rather than to active work. A small branch of the order, consisting of nuns, was founded in 1086, which has now five convents in Italy. There is in the vicinity of Naples a mountain which takes its name from a convent of the Camaldoli situated on its top, from which the traveler enjoys a prospect of remarkable grandeur and beauty. The order has greatly declined, but still has several monasteries in Italy, one in Poland and one in Brazil. Its greatest members have been Gratian, the canonical jurist of the 12th century, and Pope Gregory XVI (1831–46).

CAMALIG, kä-mạ-lēg', Philippines, a town in the southeast part of the island of Luzon, situated within six miles west-northwest of the city of Albay in a plain near the source of the Juaya River. Hemp-growing is the leading industry. Pop. 14,868.

CÁMARA Y LIBERMOORE, kä'mạ-rä ē lĭv'er-mōra, **Manuel de la**, Spanish naval officer: b. in Malaga in 1836. He was educated at the naval academy in San Fernando, and served in the Mexican campaign as staff officer of the French general, François Jurién de la Gravière, and later acted as sailing master and lieutenant of the *Villa de Madrid* and the *Vencedora*. He was active in the campaign against Peru and Chile, and in the struggle with Cuba (1868–78); and commanded a squadron in the Philippines as captain. Later he became chief of the naval commission to the United States and London, and rear-admiral. He commanded the squadron dispatched to the Philippines during the progress of the Spanish-American War. On 16 and 17 June the Cadiz reserve squadron under Admiral Cámara left port and sailed eastward through the Mediterranean. His fleet included troopships convoyed by the *Pelayo* and the best of the men-of-war, except those with Cervera in the West Indies. The United States consul at Port Said protested against permitting the Spanish fleet to refill its bunkers with coal there; nevertheless Cámara received orders to proceed through the Suez Canal. At this juncture an official bulletin of the Navy Department at Washington announced that Commodore Watson would "take under his command an armored squadron with cruisers and proceed at once to the Spanish coast." That was on 27 June. As though to emphasize the threat came Cervera's defeat on 3 July. On 6 July Cámara's squadron was recalled to protect the Spanish coast; and so Watson's fleet, which had scarcely begun to exist, had yet completely fulfilled its destiny. Later he was chief of the training ships for cadets and captain-general of the department of Ferrol. He became vice-admiral in 1903 and retired in the same year.

CAMARASAURUS, kăm-ạ-rạ-sôr'us, a genus of amphibious dinosaurs (see DINOSAURIA), resembling the brontosaurus but of more massive proportions, with heavier fore limbs and shorter tail. An incomplete skeleton found in the Jurassic strata near Cañon City, Colo., was the first of these gigantic animals discovered in America. It was deposited in the American Museum of Natural History, New York. The length of this animal was estimated by Professor Cope at 75 feet; its name was suggested by the hollow-chambered vertebræ of the back and neck. The atlantosaurus, of which the femur is over six feet long and two feet across at the head, was probably the same animal.

CAMARGUE, La, kạ-märg', France, an island in the department of Bouches-du-Rhône, southeast France, formed at the mouth of the river by its two principal branches. It has an area of about 300 square miles. It is protected from the inundations of the river by dykes, and is mostly an unhealthy tract of pools and marshes, only a small portion of it being cultivated. Horses and cattle are raised on the island.

CAMARILLA, kä-mä-rē'lya, a word first used in Spain, but now in other countries also, to express the influence of certain persons in obstructing the operation of the official organs of government. When Ferdinand VII, in 1814, returned to Spain, he was surrounded by flatterers, who prevailed upon him to violate his promise of giving the people a constitution. They were called *camarilla* either from the room where they remained in waiting, or in allusion to the Council of Castille (*Cámara de Castilla*). Until the revolution of 1820 the camarilla consisted mostly of men without talent and passionately opposed to everything new; but when the King recovered his power in 1823 they became more influential and have since repeatedly interfered with the ministers.

CAMARINA, kä-mạ-rē'nạ, Sicily, an ancient town on the southern coast of the island, founded by a colony from Syracuse in 599 B.C. Its first overthrow, which occurred 553 B.C., was the result of a revolt from the parent city. On its reduction it was razed to the ground, but was afterward rebuilt. It was in an exposed position in the Carthaginian and Roman wars, and was several times taken, retaken and destroyed. Its ruins to-day are about five miles in circumference.

CAMARINES, North and South, Philippines, two provinces in the southeastern part of the island of Luzon. Area, 3,279 square miles. The name is also applied more vaguely to the whole of the southeastern peninsula of the island. The formation of the peninsula is volcanic; the Caravallos range of mountains extends its whole length, from north to south, and seven of its peaks are active volcanoes. One of them, which is continually emitting smoke and flame, is well known to mariners coming from the east, and forms a kind of natural lighthouse. The most important product is rice. The soil of the two provinces possesses the same remarkable fertility which accompanies all the volcanic formations throughout the archipelago. Tobacco, sugar, coffee, cocoa and indigo are largely produced for exportation; but the chief occupation of the inhabitants of the Camarines is the culture of the pineapple, and the manufacture of pina cloth (q.v.). The women of the Camarines are esteemed the most artistic embroiderers in Luzon of the delicate pina and also display singular skill in the working of gold and silver filigree. All the artificers in precious metals are women; and some articles of jewelry, especially their neck chains, are very beautiful. The agriculture of the Camarines indicates in some respects a degree of progress beyond that of the other provinces of the island. The ox, and occasionally the horse, are used in plowing, instead of the slow, unwieldy buffalo, so generally preferred by the native East Indian farmer. The Camarinians have also discarded the primitive plow, formed from a single piece of crooked timber, with a point hardened by fire; and have substituted in its place a more modern style of implement. The provinces have well-constructed roads; the rivers abound in fish and are crossed by substantial stone bridges. The Naga River, which drains the lakes Bato, Baao, Buhi and Iryga, and empties into the Bay of San Miguel, is navigable about 40 miles for vessels drawing not more than 13 feet of water. The industrial development of these provinces has been accompanied by a notable increase in population; and this is composed, with but small exception, of the brown race of the Philippines, which has yielded so readily to the influences of Christian civilization. The Camarines have not had their progress retarded like other provinces of Luzon, by the troublesome presence of the wild negrito race.

CAMASS, a genus (*Camassia*) of plants of the lily family, including six species, natives of western North America. They have narrow leaves and many-flowered racemes of blue, purple or white flowers. Some of the species are in cultivation. The bulbs of the common camass (*C. quamash*) of the northern Pacific Coast were a favorite food of the Indians.

CAMASS-RAT, a rodent quadruped of the northwestern United States, similar to the gopher (q.v.). Its chief food is the camass (*Camasia esculenta*).

CAMBACÉRÈS, kän-bạ-sā-rās, **Jean Jacques Régis de, Duke of Parma,** French statesman: b. Montpellier, 18 Oct. 1753; d. Paris, 8 March 1824. His zeal and talents soon obtained him distinction, and the office of a counsellor at the *cour des comptes* at Montpellier. At the beginning of the Revolution he received several public offices, became in September 1792 a member of the Convention, and labored in the committees, particularly in the committee of legislation. On 12 Dec. 1792 he was commissioned to inquire of Louis XVI whom he desired for his counsel, and it was on his motion that the counsel was allowed to communicate freely with the King. In January 1793 he declared Louis guilty, but disputed the right of the Convention to judge him, and voted for his provisional arrest, and in case of a hostile invasion, death. On 24 January he was chosen secretary of the Convention. As a member of the Committee of Public Safety he reported, in the session of 26 March, the treason of Dumouriez. In August and October 1793 he presented his first plan for a civil code, in which his democratical notions were displayed. Subsequently, as a member of the Council of the Five Hundred, he presented the *Projet de Code Civil*, 1796, which became the foundation of the Code Napoléon. On 20 May 1797 he left his seat in the council. A year afterward he appeared among the electors of Paris; and after the revolution of the 30th Prairial, VII (19 June 1799), was made Minister of Justice. On the 18th Brumaire he was chosen second consul, and in that office made the administration of justice the chief object of his attention. After Napoleon had ascended the throne, Cambacérès was appointed arch-chancellor of the empire, and after obtaining many high distinctions, became in 1808 Duke of Parma. During the campaign against the allied powers in 1813, Cambacérès was made president of the council of regency. At the approach of the allies in 1814 he followed the government to Blois, and from that place sent his consent to the abdication of the Emperor. When Napoleon returned in 1815 Cambacérès was again made arch-chancellor and Minister of Justice, and subsequently president of the Chamber of Peers. After the second fall of Napoleon he was banished, as a regicide, but in 1818 was permitted to return.

CAMBALUC, käm-bạ-look', the name by which the city we now call Peking became known to Europe during the Middle Ages. It was the form given by Marco Polo (q.v.) to the Tartar word, *Khambalu*.

CAMBAY, kăm-bā', British India, a seaport of Hindustan, Bombay presidency, the chief town of a native state of the same name, at the head of the Gulf of Cambay, 76 miles north-northwest of Surat. It was once a place of importance, but owing to the silting-up of the gulf, and the bore or rushing tides, has greatly declined. The tides run in at from 6 to 7 knots an hour, rising as high as 33 feet, and are very dangerous to shipping. Among the buildings are several mosques and Hindu temples, and many religious structures of the Jains. The natives are expert jewelers and goldsmiths, and agate, carnelian and onyx ornaments are exported. The trade is chiefly in cotton, ivory and grain; the latter product being shipped to Bombay. Pop. 31,870. The state has an area of 350 square miles, and a population of 75,225.

CAMBERT, kän-bär, **Robert**, French musician: b. Paris, about 1628; d. London 1677. He founded the Royal Academy of Music, now the Paris Grand Opera. He was the first French opera composer, his works including 'La Pastorale' (1659), the first French musical comedy; 'Ariane et Bacchus' (1661); 'Pomone' (1671); and 'Adonis.' For 22 years he was associated with the Abbé Perrin in the conduct of French opera, and going to England subsequently became «Master of the Music» to Charles II.

CAMBERWELL, England, a metropolitan and parliamentary borough of London, on the south of the Thames, in Surrey, between Lambeth and Deptford. Area, 4,480 acres. The borough has inaugurated a great working-class housing scheme. Its three divisions, North Camberwell, Peckham and Dulwich, each return one member to Parliament. Pop. (1911) 261,328. Consult Allport, 'Collections Illustrative of Camberwell and Neighborhood' (1841); Blanch, 'Ye Parish of Camberwell: Its History and Antiquities' (1875).

CAMBERWELL BEAUTY, the common English name of the *Vanessa* or *Euvanessa antiopa*, a large and beautiful butterfly found in Great Britain, but much more common on the continent of Europe and in North America, where it is called Mourning Cloak. It measures three inches or more between the extremities of its extended wings, which are of a dark-brown color, with a broad light-yellow border, and a row of blue spots near the edge.

CAMBIASO, kăm-bē-ä'sō, **Luca** (called LUCHETTO DA GENOVA), Italian painter and sculptor: b. Moneglia, near Genoa 1527; d. Madrid 1585. His best works are the 'Martyrdom of Saint George'; 'Saint Benedict' and 'Saint John the Baptist,' at Roccrettini and the 'Rape of the Sabines,' in the Palazzo Imperiale, at Terralba, near Genoa. Late in life, at the invitation of Philip II, he visited Madrid, and executed an immense composition, representing the 'Assemblage of the Blessed,' on the ceiling of the Escorial. For his ability as a sculptor, with examples of his skill in that art, see the fifth volume of Thième-Becker, p. 430.

CAMBIER, kän'bē'ä', **Emeri Henri Célestin**, Belgian Catholic missionary: b. Flobecq, Belgium, 2 Jan. 1865. He was educated at the College of Enghien and at the seminaries of Bonne Espérance and Schent-lez-Bruxelles. In 1888 he was ordained to the priesthood and as a member of the congregation of the Immaculate Heart of Mary was sent to the Kongo mission field, where he founded the missions of New Antwerp 1890, Tuluaburg 1891, Merode-Salvator 1894, Saint Trudo 1895, Hemptinne-Saint Benedict 1897 and Saint James-Tielen 1898. In 1901 he organized Kassai into a mission district and in 1894 became the first prefect apostolic of Upper Kassai, Belgian Kongo. He made several journeys to Belgium in the interests of his mission and studied tropical diseases in order the better to combat sickness in his prefecture. He brought to Africa a complete equipment for a hospital for the treatment of the sleeping sickness. He served as member of the Commission for the Protection of the Natives of the Kongo and was made officer of the Royal Order of the Lion. He wrote the first grammar of the Bangala tongue (1890).

CAMBIER, Ernest, Belgian explorer: b. Ath 1844; d. 1909. He entered the army, serving as adjutant on the general's staff, and in 1877 went as geographer on the first expedition of the International African Association, under the leadership of Crespel. The latter died in Zanzibar in 1878, and Cambier became leader. Accompanied by Wauters and Dutrieux, he started for the interior from Bagamoyo, and after a difficult journey reached Unyamwezi; after the death of Wauters and Dutrieux's return to Europe, he went on to Karema on Lake Tanganyika. Here, in September 1879, he established the first post and scientific station of the Association, and remained there till 1882. He published 'Rapports sur les marches de la première Expédition de l'Association internationale.'

CAMBIUM, in botany, the layer of delicate thin-walled cells separating the wood from the bast in a great many stems and in a cross section appearing as a ring. The growth of the stem takes place by the deposition, on the outside of the wood, of new wood-layers formed from the cambium, and, on the inside of the bast, of new layers of bast formed from the outer cells of the cambium layer. To this circumstance — that it produces different kinds of cells — it owes its name (connected with the Latin *cambire*, to exchange). In conifers and dicotyledonous woody perennials the primary bundles are arranged in a circle, and their cambium layers are thus made to form a more or less continuous ring of cambium in the stem. By the deposition of new layers of wood and bast regularly taking place, especially in spring, at the inner and outer surfaces of this cambium-ring, the stem is caused to increase in thickness.

CAMBLES, a gluttonous king of Lydia, who is said to have eaten his own wife, and afterward killed himself for the act.

CAMBODIA, or **CAMBOJA**, Indo-China, nominally a state under a French protectorate, but practically a French dependency, situated on the lower course of the Mekong, 220 miles from northeast to southwest, and 150 miles broad, comprising an area of 45,000 square miles. The coast, 156 miles long, indented about the middle by the Bay of Kompong-Som, offers but one port, Kampot. Among the numerous islands along the coast are Kong, Rong and Hon-Nan-Trung, most of them inhabited. The principal river, the Mekong (in Cambodian, Tonlé-Tom, «Great River»), flows through Cambodia from north to south as far as Chen-Tel-Pho, and thence southwest till, at the town of Pnom-Penh, it divides into two arms, the Han-Giang, or Bassac, and the Tien-Giang, or Anterior River, both flowing south. Above Pnom-Penh is a north-northwest outlet for the surcharge of the Tonlé-Tom, the Tonlé-Sap («Sweet Water River»), expanding into the Great Lake, 100 miles by 25 miles in area, with a maximum depth of 65 feet. The greater part of the country is low, well watered and heavily timbered. The climate presents a dry and wet season (June to November) and is fairly healthv. The soil is amazingly fertile, producing large quantities of rice, besides silk, pepper, maize, sugarcane, cotton, betel, tobacco, indigo, coffee, etc. Timber is abundant. Gold and precious stones are found, besides iron, tin, limestone and salt. The breeding of cattle is a flourishing native industry. Among wild animals are the elephant, wild buffalo, deer and tiger. The Cambodians were formerly a highly cultured and civilized race. Various architectural remains, witnessing to former greatness, are found throughout the country. The present population is very mixed, being composed of Annamites, Malays and Chinese, with a seasoning of aboriginal racial elements. The religion is Buddhism. Polygamy is practised, the number of wives being restricted to three. In early times Cambodia was a powerful state to which even the kings of Siam paid tribute, but it gradually fell into decay, until about the close of the 18th century the Siamese annexed part of Cambodia to their own land, and reduced the rest of the country to a state of dependency. France, on 11 Aug. 1863, concluded a treaty with the king of Cambodia, Nerodom, placing Cambodia under a French protectorate. This treaty was superseded by that of 17 June 1884, under which the king of Cambodia accepted all the reforms, administrative, judiciary, financial and commercial, which the government of France might institute. The present King Sisowath succeeded to the throne in 1907. The chief imports are salt, sugar, wine and various manufactured goods, such as textiles and arms; the exports include salt-fish, spices, cotton, tobacco and rice. The external trade is mostly passed through Saigon in Cochin-China. The capital is Pnom-Penh (pop. 54,621). Pop. 1,634,252, of which about 1,100 are Europeans, exclusive of military.

CAMBODIA, or MEKONG, a large river of southeastern Asia, which rises in Tibet, passes through Yunnan, a province of China, Laos, Anam, Cambodia and French Cochin-China, and falls into the Chinese Sea by several mouths, after a course of about 2,600 miles. Its navigation is much interrupted by sandbanks, rapids, etc., at various points of its middle and upper course. The Tonlé-Sap (a lake covering an area of 100 square miles in the dry season and 770 square miles in the rainy season), on the frontiers of Cambodia and Siam, is connected with the Mekong.

CAMBON, kän bôn, **Jules Martin,** French diplomatist: b. Paris, 5 April 1845. He studied for the law and fought in the Franco-Prussian War, reaching the grade of captain. Entering the civil service, he became prefect of Constantine in 1878, prefect of the Department du Nord in 1882, prefect of the Rhone in 1887, governor-general of Algeria in 1891 and Ambassador to the United States 1897–1902. In that capacity he represented Spain in drawing up the Spanish-American protocol in 1898. From 1902–07 he was Ambassador at Madrid, and from 1907–13 was Ambassador at Berlin, where he made strenuous and successful efforts to find a peaceful solution of the Agadir crisis of 1913. He is a brother of Pierre Paul Cambon (q.v.).

CAMBON, Pierre Joseph, French statesman: b. Montpellier, 17 June 1754; d. near Brussels, 15 Feb. 1820. Engaged in commercial pursuits, he became interested in the Revolution, and on hearing of the flight of Louis XVI he caused the republican government to be proclaimed in his native town. He was sent to the legislative assembly, and while supporting the cause of democracy, gave particular attention to financial matters. Most of the great measures which enabled the government to get through the revolutionary period were suggested or controlled by him; and to him the honor is due of having laid the foundation of the modern financial system of France. He promoted the confiscation of the estates of the *émigrés* in 1792, and made, after 10 August, a report in which he argued that Louis XVI, having held a secret correspondence with the enemies of France, was guilty of high treason. He presided over the last sittings of the legislative assembly, and afterward took his seat as a member of the Convention. Here he opposed with equal energy the partisans of monarchy and of terrorism. When Louis XVI was arraigned before the Convention, he voted for his immediate death, and against the appeal to the people. He opposed the creation of the revolutionary tribunal, and insisted upon trial by jury. At the opening of the Convention, he had been appointed member of the Committee on Finances; 7 April 1793 he entered the Committee of Public Safety. On 2 June, when the Girondists were threatened by the infuriated mob calling for their proscription, he boldly took his place among them, hoping to be able to save them from violence and arrest. The next year he made another report on the administration of finances, which is considered a masterpiece of financial ability, and gives a full sketch of the plan which was afterward adopted for the regular registration of public debt. In the conflict which brought on the revolution of the 9th Thermidor, Cambon took part against Robespierre and his adherents; but though he had been instrumental in their defeat, he was charged with having been their accomplice, and a warrant was issued against him. He succeeded in eluding arrest, and, when amnesty was proclaimed by the Convention, he retired to an estate in the vicinity of Montpellier. In 1815 he was elected a member of the Chamber of Deputies. On the second return of the Bourbons, he was exiled as a regicide.

CAMBON, Pierre Paul, French diplomatist: b. Paris, 20 Jan. 1843. He was graduated at the Ecole Polytechnique in 1863, and, after serving as secretary to Jules Ferry, became secretary of prefecture for the Alpes-Maritimes, prefect successively of the departments of the Aube, Doubs and Nord and French resident-general in Tunis. He was appointed Ambassador to Spain in 1886, was transferred to Constantinople in 1890 and to London in 1898. To him is due in large measure the sealing of the Anglo-French entente.

CAMBORNE, England, market town of Cornwall, 11 miles northwest of Falmouth, situated on the slope of a gently rising hill. There is a granite church in the Perpendicular style, restored in 1862. It also contains a market-hall, a mining school, a workingman's institute, and a museum of mineralogy. Near it are extensive lead, tin and copper mines, and mining machinery is manufactured. Pop. 15,829.

CAMBRAI, kăṅ-brā, or **CAMBRAY**, France (Flemish, KAMBRYK), fortified city on the Scheldt, in the department Nord, 37 miles south-southeast of Lille by rail. From this place the linen cloth known by the name of cambric got its name. Cambrai is the seat of an archbishop. The Revolution stripped it of all its principal ornaments. The beautiful cathedral and the tomb of its archbishop, the celebrated Fénelon, were razed to the ground. There is a new monument to the memory of Fénelon in the present cathedral, a modern building of indifferent architecture. There is a large and handsome modern Hôtel de Ville and an ancient belfry tower. Cambrai is the seat of a diocesan seminary, communal college and has a valuable public library. Cambric and other linen goods, cotton, lace thread, leather goods, sugar, soap, beer, etc., are manufactured; and there is a trade in grain, oil-seed, hemp, etc. Cambrai is the Camaracum of the Romans. In 1508 the league against Venice was concluded at Cambrai between the Emperor Maximilian, Louis XII, the Pope and Ferdinand of Aragon; in 1529 the peace with Charles V. Louis XIV took Cambria from the Spaniards in 1677, and it was finally confirmed to France by the Treaty of Nijmegen in 1678. Pop. 21,791.

CAMBRIA, the Latin name of Wales (the Roman Britannia Secunda), derived from Cymri, the name of the branch of the Celts to which the Welsh belong, by which they have always called themselves.

CAMBRIAN from «Cambria,» an ancient name for Wales) is a term applied to the earliest time period of the Paleozoic Era, and to the system of rocks laid down during that period. It was first applied by Murchison and Sedgwick to rocks of England and Wales, about 1835. In Cambrian time animal life on the earth was already highly differentiated. All the great groups of the animal kingdom except the vertebrates were present then and definitely characterized. The principal types, so far as the fossil evidence goes, were Brachiopods and Trilobites, but many others existed, such as mollusks, marine worms, siliceous sponges, graptolites and jellyfish, and by the end of the period starfish and crinoids. It is probable that plants, such as seaweeds, existed, but the evidence is very obscure. The climate during the Cambrian period was probably warm, even up to the Arctic Circle, but not torrid. This evenness of temperature may have been due to a much larger part of the earth's surface being covered by water than in later time, or to a difference in the composition of the atmosphere, more carbon dioxide being present. At the beginning of Cambrian time the North American continent was probably larger than now. On the east a sound stretched from Labrador to Alabama, separating an island known as Old Appalachia, which extended east beyond the present coast. Central United States was largely land. On the west, a second sound extended from the Arctic south into Nevada and California, separating another land mass on the west, which also probably reached beyond the western coast.

During Cambrian time the continental land mass slowly sank, and by the end of the Cambrian a great interior sea covered the whole Mississippi Valley and large areas both east and west. Changes in land and sea were also going on in other continents, large parts of which were under water during later Cambrian time. The period was without notable folding, but was marked by great volcanic activity in Wales and Scotland. In China, Norway and possibly at other points, rocks of very early Cambrian, or else of very late Algonkian Age, bear evidence of glacial origin.

The Cambrian system is fairly well defined at its base, since the rocks are deposited upon the upturned, eroded edges of Algonkian and older strata, indicating a great time break. The top of the Cambrian grades into the Ordovician, so that geologists are not agreed as to the line of demarcation. In North America the rocks of the Cambrian system are divided into three series, as follows: (1) The Lower Cambrian, or Georgian, (2) the Middle Cambrian or Acadian, and (3) the Upper Cambrian, or Potsdam (Saratogan). The Lower Cambrian rocks are largely restricted to the long narrow sounds already described. As the continent gradually sank, the areas of Cambrian deposition became larger, and Middle and Upper Cambrian sediments were laid down over much of central United States from the Appalachians to the Sierra Nevada, south as far as northern Arkansas. They have since been eroded from parts of this area, and in still other parts lie hidden below more recent deposits. Cambrian rocks outcrop in large areas in the Appalachian Mountains, the Adirondacks, central Wisconsin, the Ozarks and in many isolated patches in the Rocky Mountains, as well as at numerous other points. The rocks indicate generally a period of tranquil change, the ocean slowly advancing over the sinking continent and islands, just as one may see it to-day along great stretches of coast. The rocks are chiefly shallow water formations, including conglomerates, sandstones and shales, though limestones are by no means unknown. In a few places as at South Mountain, Pa., there are rocks representing lava and volcanic ash interstratified with detrital sediments. In the Appalachian region, the Cambrian sediments vary from 3,000 to 12,000 feet in thickness. Over central United States they are much thinner, but in British Columbia they are reported to reach the enormous thickness of 40,000 feet.

In Europe the Cambrian rocks are generally developed more fully than in North America; thus the conglomerates, sandstones, shales, slates and quartzites of the Welsh Cambrian are fully 20,000 feet thick and contain much volcanic material. They are rocks indicating shallow-water conditions, and show three divisions. They extend from Wales, along Sweden, Norway and Lapland into Russia, having in Sweden a thickness of 2,000 feet. To the east the Cambrian formations thin out, and in central Russia die out altogether, the Ordovician resting directly on the Archæan. There are considerable areas of Cambrian in Germany, Bohemia, France, Portugal and Spain; also in northeast China, in the Salt Range in India, in Australia and in Argentina.

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CAMBRIC, a fine, thin kind of linen cloth manufactured originally, it is said, at Cambrai (q.v.) in French Flanders, whence the name. Cambric is manufactured in the north of Ireland, in England, Switzerland and France, and is now chiefly used for handkerchiefs. The name is also applied to a cotton fabric which is in reality a kind of muslin.

CAMBRIDGE, Ada, the pseudonym of **Mrs. George Frederick Cross,** Australian novelist: b. Saint Germains, Norfolk, England, 21 Nov. 1844. She was married in 1870 to Rev. G. F. Cross and went with him to Australia, since residing in bush country districts. She is the author of 'My Guardian' (1877); 'In Two Years' Time' (1879); 'A Mere Chance' (1882); 'A Marked Man' (1891); 'The Three Miss Kings' (1891); 'Not All in Vain' (1892); 'A Little Minx' (1893); 'A Marriage Ceremony' (1894); 'Fidelis' (1895); 'A Humble Enterprise' (1896); 'At Midnight' (1897); 'Materfamilias' (1898); 'Path and Goal' (1900); 'The Devastators' (1901); 'Thirty Years in Australia' (1903); 'Sisters' (1904); 'A Platonic Friendship' (1905); 'A Happy Marriage' (1906); 'The Eternal Feminine' (1907); 'The Retrospect' (1912); 'The Hand in the Dark' (1913).

CAMBRIDGE, Adolphus Frederick (1st Duke of): b. London, 24 Feb. 1774; d. 8 July 1850. He was the youngest son of George III, and the uncle of Queen Victoria. He entered the British army as ensign when 16 years of age, and completed his education at the German University of Göttingen. He leaned at first to the side of the opposition on the question of the French war, but afterward sided with the government. He served in the Hanoverian and British armies in several campaigns on the Continent. In 1816 he was sent to Hanover as viceroy, and administered the affairs of the kingdom with wisdom and discretion. In 1837, on the separation of Hanover from the British Crown, he returned to England again. From that period until his death he was best known to the public as the president of charitable societies.

CAMBRIDGE, George William Frederick Charles (2d Duke of), English general, son of the preceding: b. Hanover, 26 March 1819; d. 17 March 1904. His rise in the army was phenomenally rapid, and was due to his close relationship to the Crown. When a lad of 19 he became a colonel, and at 26 was a major-general. In 1850 he succeeded his father as Duke of Cambridge, in 1854 was advanced to lieutenant-general, and in 1856 to that of general. He commanded the two brigades of Footguards and Highlanders which formed the first division of the army sent to the Crimea. He led these troops into action at the battle of Alma, and at Inkerman had a horse shot under him. He was constitutionally not well adapted for high command in the field, lacking the imperturbability of the born soldier. After his experiences at Inkerman his physician directed him to withdraw for a time from camp life. He retired first to Pera, and soon after to England. On the resignation of Viscount Hardinge in 1856, he was appointed commander-in-chief of the British army. As commander-in-chief he opposed most of the reforms introduced into the army, including short service and the abolition of purchase; but he loyally carried out changes which he did not approve. He retired in 1895. Consult Sheppard, 'Private Life of H.R.H. the Duke of Cambridge' (London 1906); Verner, 'Military Life of the Duke of Cambridge' (2 vols., London 1905).

CAMBRIDGE, England, an inland county bounded on the north by the county of Lincoln; on the west by Northampton, Huntingdon and Bedford; on the south by Hertfordshire and Essex; and on the east by Suffolk and Norfolk. A great part of the northern half of the county belongs to the fen district and is very flat; farther south it is undulating, and in the southeast some heights occur. The principal rivers are the Cam or Granta, and the Ouse, with the Nene in the north. An important portion of the county, including the Isle of Ely, belongs to the great artificially drained tract known as the Bedford Level (q.v.). About nine-tenths of the total acreage of the county is now productive, and a greater proportion of land is under corn crops than in any other county in the kingdom. Potatoes, turnips and mangold are the chief green crops. The southern portion of the county abounds in dairy farms, celebrated for the production of excellent butter and cheese. The part of the county extending from Gogmagog Hills to Newmarket is chiefly appropriated to sheep-walks. The chief mineral productions are the phosphatic nodules known as coprolites, lime and clay for brick and tiles; and peat is cut for fuel. For parliamentary purposes the county is divided into four divisions — Wisbech, Chesterton and Newmarket, and the parliamentary borough of Cambridge, each returning one member to Parliament. Administratively the ancient county embraces the two counties of Cambridge and the Isle of Ely. There are two municipal boroughs, Cambridge and Wisbech. The educational institutions include a day training college for schoolmasters, and the new Homerton undenominational training college for women at Cambridge, and a theological college founded in 1876 at Ely; there are also more than 225 elementary schools in the county. Area, 553,241 acres. Pop. 198,074. See also Cambridge, University of.

CAMBRIDGE, England, capital of the county of Cambridge, is situated on the Cam, about 56 miles north by east by rail from London. It is a municipal and parliamentary borough, the seat of a celebrated university (see

CAMBRIDGE, UNIVERSITY OF), and has a large agricultural market.

Geology.— The geological formation of Cambridge and the surrounding district consists chiefly of clay. The following strata are to be found — Chalk, Marl, Cambridge Greensand, Gault, Kimeridge Clay, Oxford Clay, Ampthill Clay, Cherryhinton Chalk and some recent alluvium which borders the rivers and tributaries, consisting of peat, sandy loam, etc. The town is made up of three main thoroughfares, two running north and south and the other east and west.

Public Buildings, Libraries, etc.— The city possesses a Guildhall, including municipal buildings, law courts and public free library. There is also a spacious corn exchange, attended weekly by buyers from all parts of the United Kingdom, and a cattle market. Addenbrooke's Hospital is a noted institution, connected as it is with the Cambridge University Medical School. Cambridge was one of the first towns to establish a public free library, which now comprises a central library and three branches with a collection of upwards of 50,000 volumes.

Churches.— Cambridge is fortunate in the number of its ancient churches, two of which are worthy of mention. The church of Saint Benedict's is the oldest, being of pre-Conquest date. It possesses a tower in the Saxon style of architecture. That of the Holy Sepulchre or «Round Church» is one of four round churches in England, and was probably in existence about the year 1130. The largest parish church is that of Saint Mary the Great (the University church), built in the perpendicular style. Other churches of interest are the Abbey (early English, 13th century), Saint Edward (rebuilt in the 14th century with the exception of the tower which is a work of the 12th century), Saint Michael (13th century), Trinity (about 1274), Saint Mary the Less (1340), Saint Botolph (14th century) and Saint Peter, which has examples of 12th century architecture. The history of nonconformity in Cambridge dates from the year 1457, and it is now well represented by its churches. The Roman Catholics have a fine church built in the early decorated style. It was commenced in 1887, through a donation from Yolande Marie Louise Lyne-Stephens. Of theologians Cambridge was the birthplace of Jeremy Taylor; it was at Cambridge the Rev. Charles Simeon founded the evangelical school of the Church of England, and at the same period Robert Hall, the great Baptist preacher, attracted large congregations. Johnny Stittle, the hedger, occupied a unique position at the end of the 18th and beginning of the 19th century, drawing a large congregation from both town and University. Thomas Hobson was famous as a carrier. He is said to have been the first to let out horses for hire, and the originator of the proverb «Hobson's Choice.»

Education.— Cambridge has 20 public elementary schools, including higher grade schools, among which we may note the Perse grammar schools, founded by Dr. Stephen Perse in 1615. The Wesleyans are represented in education by the Leys school, the Roman Catholics by Saint Edmund's House, the Presbyterians by Westminster College, and more recently the Congregationalists have removed from Cheshunt, Herts, to Cambridge, preliminary to the erection of a new college. Homerton College has about 150 female students in training for educational duties.

Railroads.— The railway companies which have connections at Cambridge are the Great Eastern, the Great Northern, the Midland and the London North Western.

Recreation Grounds.— Cambridge is fortunate in its number of common lands and recreation grounds, numbering in all and having a total area of 300 acres. Of the recreation grounds Parker's Piece is a noted cricket and football ground, where all the University matches were played, until they purchased their own grounds.

Government.— The corporation of Cambridge, under the «Municipal Reform Act,» consists of a mayor, 10 aldermen and 30 councillors. The University also returns its quota of two aldermen and six councillors. The town returns one member to Parliament.

History.— There is every proof that in its early days Cambridge was an important trading centre. Its situation on the Cam made it easily accessible from the surrounding district for miles around, and provender, fuel and merchandise were conveyed by water to all parts of East Anglia. It was the seat of Stourbridge Fair, one of the largest fairs in Europe. That the Romans occupied the town is evident from the fact that numerous Roman remains have been found at various periods. Miles of ancient earthworks, said to be of British origin, surround Cambridge, and in the town itself there is a large mound called «Castle Hill,» probably of Saxon origin and raised as a defense against the incursions of the Danes. In the years 870 and 1010 the town was destroyed by the Danes. William the Conqueror built a castle here in 1068. The year 1110 is alleged to be the date of the origin of the university, at which time, we read that learned monks visited Cambridge to teach philosophy and other sciences. Richard II held a Parliament at Cambridge in 1388. The town was frequently visited by the plague («Black Death»), and in 1630 the mortality was terrible. At the time of the Civil War Oliver Cromwell (formerly a student of Sidney Sussex College) represented Cambridge in Parliament, and the town supplied a large number of men for the Parliamentary army. William Downing did considerable damage both to the colleges and to the parish churches in 1643. Queen Victoria and her consort visited Cambridge in 1845 and again in 1847; and as chancellor of the university, the influence for good, exercised by the Prince Consort, was predominant. The King and Queen visited Cambridge on 1 March 1904 to open the new university museums. The second meeting of the British association was held at Cambridge in 1833, and subsequent meetings were held in 1845, 1862 and 1904. Apart from the University, Cambridge would lose much of its importance. The colleges with their various styles of architecture, surrounded by gardens and «college walks,» are a constant source of delight. The river Cam winds its course through the college grounds for a distance of about three-quarters of a mile. Nine bridges connect the colleges and grounds where nature and art combine. Below the town, the river is the scene of the well-known college boat races which occasion the visit of thousands of people.

Area and Population.— The town covers an area of 3,278 acres. Much house property has been destroyed to make room for the continuous additions to colleges and university buildings, with the result that residents have migrated to adjacent districts. Pop. 40,027.

Bibliography.— Atkinson and Clark, 'History of Cambridge' (1897); Carter, 'History of Cambridgeshire' (1819); Clark, 'Historical and Descriptive Notes on Cambridge'; Conybeare, 'History of Cambridgeshire' (1897); Cooper, 'Annals of Cambridge, 693–1853' (5 vols.); 'Memorials of Cambridge' (3 vols., 1866); Stubbs, 'Cambridge and its Story' (1903).

CAMBRIDGE, Ill., the county-seat of Henry County, a village on the Rock Island and Peoria Railroad, about 28 miles southeast of Rock Island. Surrounded by a productive agricultural district, it has a thriving domestic and export trade in farm produce, grain and cattle, etc. Pop. 1,277.

CAMBRIDGE, Mass., city and one of the county-seats of Middlesex County, situated on the Charles River and the Fitchburg division of the Boston and Maine Railroad, also connecting with the Boston and Albany Railroad; opposite and joined to Boston by nine bridges. It was founded in 1630–31, under the name of «Newe-Towne,» or «Newtown,» and did not receive its present name until several years later. In 1636 the General Court appropriated $2,000 to locate a school in Old Cambridge, which later became Harvard College, now Harvard University. In 1631 Cambridge was 35 miles long and only one mile wide, including the townships now incorporated as Billerica, Bedford, Lexington, Arlington, Brighton and Newton, all these having been gradually separated from it. The city was formerly divided into villages called Old Cambridge, Cambridgeport, East Cambridge and North Cambridge, names which are still used to designate certain districts. It has grown into a populous centre, manufacturing glass, furniture, organs, steam-engines, etc., the total value of which amounts annually to over $45,000,000. Nearly 1,200 retail establishments supply the wants of Cambridge, paying $2,250,000 a year in wages, and having sales of over $15,000,000. The first printing office in the United States was located in Cambridge, and the 'Bay Psalm-Book,' published by Stephen Day and printed in 1640, was the first book from this press. Cambridge has now extensive printing establishments, including the Riverside Press, the Athenæum Press and the University Press. For historical and literary associations, Cambridge is one of the most famous cities in the United States. The venerable Washington elm, under which Washington took command of the American army, 3 July 1775, stands at the corner of Mason and Garden streets. «Craigie House,» built by Col. John Vassall in 1759, was Washington's headquarters in 1775–76, and afterward became the home of the poet Henry W. Longfellow until his death. On Elm avenue is «Elmwood,» the birthplace and home of James Russell Lowell, who lived here 1819–91. A part of the place, bought by public subscription, is preserved as a public park. This city was also the home of Oliver Wendell Holmes, William Henry Channing, Margaret Fuller Ossoli, Col. Thomas Wentworth Higginson, Louis Agassiz, John Fiske and Charles Eliot Norton. The fine city hall and land for a park was the gift of a former citizen, Frederick H. Rindge, who also presented the city with a public library, an institution now called the Rindge Manual Training School, and other benefactions which amounted to more than $1,000,000. The beautiful Mount Auburn cemetery is partly in Cambridge and partly in Watertown. Among important buildings are those of Harvard University; Radcliffe College; Cambridge Hospital; Manual Training School; the Latin and High Schools; Public Library; and Middlesex County Courthouse. Much has been accomplished toward developing a system of parks which includes nearly the entire river front, and extends around the manufacturing district. In two recent years the total building operations in new factories, fine apartment-houses and private residences amounted to $5,000,000. The total value of taxable property is $130,000,000. The city buildings, land and equipment are valued at $4,000,000; its parks at $4,300,000, and it owns its waterworks which cost $6,500,000. The administration consists of a mayor and city council. Pop. 114,000. Consult Bacon, 'Cambridge and Vicinity' (Newark 1892); Paige, 'History of Cambridge' (Boston 1877); Eliot, 'History of Cambridge' (Cambridge 1913). See HARVARD UNIVERSITY.

CAMBRIDGE, Md., a city and county-seat of Dorchester County, 58 miles southeast of Baltimore on the Choptank River near Chesapeake Bay and on the Seaford and Cambridge Railroad. Cambridge was settled in 1684 and was incorporated as a city in 1900. It is governed by a mayor, elected every two years by the city council, which includes the mayor and four aldermen. Cambridge has important manufactures of underwear and lumber and as the centre of a fertile agricultural district has an active trade in farm produce and live stock. Fruit, vegetable and oyster canning industries are carried on to a considerable extent. Pop. 6,407.

CAMBRIDGE, N. Y., village of Washington County, on the Delaware and Hudson Railroad, 28 miles northeast of Albany. The Cambridge Valley Agricultural and Stockbreeders' Association is located here and seed, steel plow, chaplet and knitting industries are carried on. The village was incorporated in 1866. Pop. 1,727.

CAMBRIDGE, Ohio, city and county-seat of Guernsey County, on the Baltimore and Ohio and Pennsylvania railroads, 55 miles north of Marietta. It is situated on a hill 800 feet above sea-level, in a coal and iron region which has also deposits of pottery clay. The industries are chiefly mining and manufactures connected with these resources. The United States census of manufactures for 1914 reported 39 industrial establishments of factory grade, employing 1,656 persons, of whom 1,435 were wage earners, receiving, annually, $1,112,000 in wages. The capital invested aggregated $2,969,000, and the year's output was valued at $3,924.000: of this, $416,000 was the value added by manufacture. Natural gas is used for heating. The city owns and operates its waterworks. The city has five banks, courthouse, children's home and Carnegie Library. It was settled in 1804, was incorporated as a city in 1887 and received a new charter of administration in 1893. A mayor, elected every two years, and a council govern the city. Pop. 13,000.

CAMBRIDGE, University of. Situated at Cambridge, England. Its origin is very obscure, and of its early history, before the 12th century, there are only very scanty records. It is clear that a university existed long before the foundation of the oldest college, and that it was powerful enough to claim and to obtain from the town very important privileges, such as immunity from taxation, the right to test weights and measures and to prescribe what amusements should be allowed or forbidden. From the bitter feeling aroused by the possession of these and other privileges frequent serious outbreaks of hostilities arose between the town and the university, resulting in the wanton destruction of valuable records, which has left little or no material for a connected history. It is probable that the university owed its origin to the schools in connection with the priory of Saint Frideswyde and the conventual church at Ely. The earliest recognition of Cambridge as a university is contained in a writ of the second year of Henry III, 1217, ordering all clerks who had been excommunicated for their adherence to Louis, son of the king of France, to depart the realm. The number of students was increased in the same reign by a migration of students from Paris in 1229, and further by a like migration from Oxford in 1240. In the early part of the 13th century students lived where they pleased, but in time they inaugurated a system of hostels or lodging-houses, in which a number had to live under the supervision of a superior; and out of this system of hostels sprang the collegiate system. The oldest of the colleges, Peterhouse, was founded in 1284 by Hugh de Balsham, bishop of Ely; it was followed by Clare College, founded in 1326 by Lady Elizabeth, granddaughter of Edward I; Pembroke Hall, in 1347, by Marie de St. Paul; Gonville Hall, afterward Gonville and Caius College, in 1348 by Edmund Gonville; Trinity Hall, in 1350, by William Bateman, bishop of Norwich; Corpus Christi College, in 1352, by the joint efforts of two Cambridge communities, the Guild of Corpus Christi and the Guild of the Blessed Virgin; King's College, in 1441, by King Henry VI; Queen's College, in 1448, by Margaret of Anjou, though it was not till 1475 that it received its code of statutes from Elizabeth Woodville, the consort of Edward IV; Saint Catherine's Hall, in 1452, by Robert Wodelarke, provost of King's College; Jesus College, in 1496, by John Alcock, bishop of Ely; Christ's College, in 1505, by the Lady Margaret, Countess of Richmond, mother of Henry VII; Saint John's College, in 1511, also by Lady Margaret; Magdalene College, in 1542, by Sir Thomas Audley; Trinity College, formed by the union of the earlier foundations of Michaelhouse, 1324, and of King's Hall, 1337, and founded in 1546 by Henry VIII; Emmanuel College, in 1584, by Sir Walter Mildmay, a college dear to all Americans as that in which John Harvard, founder of Harvard College, was educated; Sidney Sussex College, in 1596, by the Lady Frances Sidney, Countess of Sussex; Downing College, in 1800, by Sir George Downing; Selwyn College Public Hostel, founded in 1882 in memory of George Augustus Selwyn, late bishop of Lichfield, formerly bishop of New Zealand. Each of these colleges is a separate corporation governed by its own statutes and practically independent of the university, though the connection between the two is necessarily very close, as every member of the university is a member of some one of the colleges, as a non-collegiate student. The head of a college is styled the master, except in the case of King's College, where he is styled the provost, and of Queen's College, which is ruled by the president. Other college officers are the tutor, who stands *in loco parentis* to the undergraduates, and the dean, who is responsible for the services in the college chapel, and for college discipline.

A code of statutes was given to the university by Queen Elizabeth, and this code remained in force till 1858, when a new code was framed by a royal commission; this latter code was again revised in 1882, when they took their present form. In 1874 all religious tests were finally abolished except for degrees in divinity; and in 1894 the university surrendered the last of its privileges over the town, which it had retained since the 13th century, and then only put an end to the bitter feeling which had existed for centuries between the town and the university, and which had led to frequent outbreaks of hostilities between the two bodies.

The university was incorporated in the reign of Elizabeth, by the name of "The Chancellor, Masters and Scholars of the University of Cambridge." The executive authority of the university rests in theory with the chancellor, who is elected for life; but as he is non-resident, it is practically in the hands of the vice-chancellor, who is elected annually from among the heads of colleges. The ultimate decision of all questions touching academic policy rests with the senate, a body composed of all those members of the university who have proceeded to the M.A. or some higher degree, and whose names are on the register of members of the senate. All legislative proposals so far as they are consistent with the statutes, which can only be altered by act of Parliament, are framed by the vice-chancellor in conjunction with the council of the senate, a body elected by the resident members of the senate and consisting of the chancellor, the vice-chancellor, four heads of colleges, four professors and eight other members of the senate. These proposals, having received the sanction of the council, are offered to the senate in the form of graces or resolutions, and must pass the senate before they can take effect. Of the other officers of the university the most important are the two proctors, whose duty it is to attend to the discipline of all persons *in statu pupillari* and to read the graces in the senate house; the registrar, who keeps the archives of the university; the public orator, who is the voice of the university on all important occasions, who writes letters in the name of the university and who presents all honorary degrees in a Latin speech; the librarian, who has charge of the university library. A general board of studies supervises the system of teaching as a whole, and each department of study is controlled by a professor and a syndicate or board. The teaching of the undergraduates is undertaken partly by the university and partly by the colleges. It takes mainly the form of lectures, delivered either by the university professors or readers, and open to all members of the university; or by college lectures to members of particular colleges or groups of colleges.

The academical year is divided into three terms: the Michaelmas term, lasting from 1 October to 19 December; the Lent Term from 8 January to within a few days of Easter; the Easter term from three weeks after Easter to 24 June. The undergraduates reside either in rooms belonging to the several colleges or in rooms in the town licensed for the purpose. They dine together in the college hall, but all other meals are taken in their own rooms. Academical dress, a gown and square college cap, must be worn in the college hall and chapel. Before proceeding to any examination for a degree they must have resided for the greater part of each of nine terms; and must have passed the previous examination, commonly called the «Little Go,» a somewhat elementary examination in classics, mathematics and divinity. Exemption from this examination can be obtained by passing various non-university examinations. The student can then, if he wishes to proceed to an «Honors» degree, devote the rest of his time to his special subject, and having kept his terms, is qualified to become a candidate for honor in a tripos, as honor examinations are called. If he wishes merely to obtain a pass degree he must first pass the general examination of somewhat similar nature to the previous, but more advanced, and can then proceed to one of the special examinations, as they are called. These examinations are in the same subjects as the tripos examinations, but the questions set are of a much less advanced nature. A student who passes a tripos is called an honor man; one who passes in a special examination is called a pass man (commonly «Pollman,» from οἱ πολλοι). The names of successful candidates are arranged in three classes, called in the case of the mathematical tripos, wranglers, senior optimes and junior optimes; in the case of the examinations merely first, second and third class. To the rule that every student before proceeding to a degree must have «kept» residence at least nine terms, there are some important exceptions. Graduates of other universities, British and foreign, who can produce evidence of special qualifications, can qualify for the B.A. degree by passing a tripos examination, or by submitting for approval a dissertation on some subject connected with the special branch of study. Students, from various educational institutions for adults both at home and in the colonies, which are said to be «affiliated» to the University, are allowed practically the same privileges. Further, diplomas in public health, psychological medicine, anthropology, tropical medicine, agriculture, geography, mining engineering and forestry are granted, after examination, to persons who are not members of the university. Having obtained the B.A. degree the student can then, after the lapse of three years, proceed to the M.A. degree, and thereby, for the first time, he obtains a voice in the government of the university. He can exercise a vote in the senate, and can «non-placet» or oppose the graces offered to the senate by the council. Of the degrees above that of B.A., the M.A. is the only one that is conferred without further examination or exercise. The degree of doctor in the various faculties can only be obtained by examination or by a dissertation. Degrees other than these already mentioned which are conferred by the university are the degrees of doctor in divinity, law, medicine, music, letters and science; master in law and surgery, bachelor of divinity, law, music, medicine and surgery. The university has power to confer honorary degrees, without residence or examination, on distinguished persons, noblemen, bishops, deans and heads of colleges. Before 1850 the only avenue to an honor's degree was by way of the mathematical tripos, or by the mathematical and classical tripos combined. The last half century has witnessed a remarkable development. New triposes have been established in moral sciences, theology, natural sciences, law, history, economics, mediæval and modern languages, oriental languages and mechanical sciences; while new professorships have been founded in archæology, fine arts, Latin, Anglo-Saxon, experimental physics, mechanism and applied science, surgery, agriculture, biological chemistry, biology, divinity, ecclesiastical history, English literature, genetics, German, mental philosophy and logic, Sanscrit and Chinese. This last was founded by Sir Thomas Wade, who was the first professor and who bequeathed to the university the first Chinese library outside China. Provision is also made for the teaching of Hindustani, Tamil, Burmese, Persian, Russian, etc.

Of the university buildings the most important is the University Library, containing over 800,000 volumes, over 10,000 manuscripts, including the famous Codex Bezæ, and 100,000 maps. The Acton Library of 59,000 volumes was presented by Viscount Morley in 1902. This library is entitled by the Copyright Act to a copy of every book published in the United Kingdom, and a large sum is expended every year in the purchase of foreign books and periodicals. The Fitzwilliam Museum contains a valuable collection of paintings, ancient marbles and coins. The Observatory stands about a mile from Cambridge, and is splendidly equipped with instruments large and small. The Museums and Laboratories of Science cover a large space of ground in the centre of the university and include laboratories, lecture-rooms, and workshops for all departments of science and medicine. These museums have been erected at great cost during the last few years, and were formally opened by King Edward in 1905. The Engineering Laboratory, probably one of the best equipped of its kind in existence, provides adequate instruction for the profession of engineer. The Cavendish Laboratory of Experimental Physics was the gift of the seventh Duke of Devonshire, late chancellor of the university. The Sedgwick Museum of Geology was built as a memorial to the late Adam Sedgwick, professor of geology. Other museums are those of classical archæology, botany, mineralogy, etc. The botanic garden occupies over 20 acres, and contains an extensive range of plant houses, a large arboretum, etc.

Two colleges, Girton and Newnham, have

been established just outside Cambridge for the education of women. The students at these colleges are admitted to university and college lectures and to the various examinations for honors. The names of those who pass are placed in the published lists, and certificates are granted to them. Many of them have obtained the highest honors, but the university confers no degrees upon them.

Two movements of the last half century have served to bring the university "into closer connection with education generally throughout the country." By the local examinations, established in 1858, the standard of instruction in so-called middle schools has been raised to and maintained at a high degree of excellence; and the movement has spread beyond all expectations. The other movement, known as the University Extension Movement, which originated in a course of lectures delivered in one or two of the large towns in the north of England in 1867, has had an equally remarkable success. The scheme is "an attempt to solve the problem of how much of what the universities do for their non-students can be done by university lectures for persons unable to go to a university." The method of teaching "has four characteristic features — the lecture, the class, the weekly paper work, and the examination." The members of the university whose names were on the board in 1915 numbered 14,417, of whom 10,968 were members of the senate or other graduates, and 3,449 undergraduates. A tabulated statement issued at the end of 1915 showed that 10,250 were serving in war duties. In that year the enrolments of undergraduates numbered 1,097, having shrunk to one-third of the usual number owing to war conditions. The ordinary income of the university for 1916 was £37,184, that of the colleges £237,405. The war has also affected adversely the finances of the university, which is faced with a probable deficit at the end of 1916 of £13,500.

Bibliography.— Cooper, 'Annals of Cambridge'; Mullinger, 'History of the University of Cambridge'; 'Statutes and Ordinances of the University'; 'Student's Handbook to the University and Colleges of Cambridge'; 'Cambridge University Calendar'; 'Quarterly Review' (April 1906).

CAMBRIDGE MANUSCRIPT, the **CODEX CANTABRIGIENSIS** or **BEZÆ,** the most famous of the uncial MSS. in the University Library, Cambridge, England, consisting of a copy of the four Gospels and the Acts of the Apostles. It was presented in 1581 to the University of Cambridge by Theodore Beza (q.v.). The Codex Bezæ and the Codex Laudianus at Oxford differ widely in text from all texts of other codices. Scrivener, the editor, and other critics look upon these divergences as interpolations of which the Codex Bezæ is said to contain no less than 600. Scrivener, nevertheless, believes that the Codex Bezæ is derived from an original of not later than the 3d century. Bornemann on the other hand contends that the Codex Bezæ contains the original text and that other versions are mutilated. Scrivener's criticism is interesting: "While the general course of the history and the spirit of the work remain the same as in our commonly received text, we perpetually encounter long passages in Codex Bezæ which resemble that text only as a loose and explanatory paraphrase recalls the original form from which it sprung. Save that there is no difference in the language in this instance, it is hardly an exaggeration of the facts to assert that Codex D (that is Codex Bezæ) reproduces the *textus receptus* of the Acts much in the same way that one of the best Chaldee Targums does the Hebrew of the Old Testament, so wide are the variations in the diction, so constant and inveterate the practice of expanding the narrative by means of interpolations." See BIBLE.

CAMBRIDGE PLATFORM, a system of church order and polity agreed on by a synod of New England churches, held at Cambridge, Mass., in 1648. It was a resolution rather than a decree, the platform itself denying the synod's authority to pronounce the latter. Its chief positions were: The one true and immutable form of church government has been prescribed in God's word. Christ is the supreme head of his Church, which, since his advent, consists of distinct, equal and self-governing bodies under him, not too large to meet conveniently in one place nor too small to carry on church work effectively. They are therefore monarchies as to him, democracies in themselves and aristocracies as to each other; but obligated to mutual communion of care, counsel, monition, worship, succor and transfer of members. Synods are useful, but not permanent, nor with authority for censure or discipline; but when their decisions accord with God's word they should be submitted to. Christ has deputed extraordinary but temporary power to his apostles, ordinary and permanent power to the churches. Officers are advantageous, but not indispensable, and each church may appoint and remove its own, but should consult its neighbor churches when feasible. These officers consist of bishops, pastors or elders (synonymous in function), and deacons who can act officially only in temporal matters. Ordination is the solemn installation of a church head into his place, following his election.

CAMBRIDGE PLATONISTS, the name given to a school of theological and philosophical thinkers of the English Church who were connected with Cambridge University, and who exercised an important influence during the latter half of the 17th century. The most important members of this school were Benjamin Whichcote, John Smith, Ralph Cudworth, Henry More, Nathaniel Culverwel, John Worthington and George Rust. Joseph Glanvil and John Norris were both Oxford men and much younger than the Cambridge thinkers, though representing the same general intellectual tendency. Sir Thomas Browne, author of 'Religio Medici' and 'Christian Morals,' is also a representative of the Platonic type of thought, but his work as an author belongs to a somewhat earlier period.

In theology, the influence of these men was in favor of toleration and liberality of view. They maintain that dogmatic uniformity is unattainable, and that the welfare of both church and state demands toleration and latitude of religious opinion. Hence they were frequently termed latitudinarians (q.v.). This position was the result of a faith in reason and a conviction that free inquiry and discussion could not be prejudicial to theological truth, and that rigid uniformity of doctrine is neither possible nor desirable. At the same time they distinguish between dogma and true religion. The former is external and necessarily changes from time to time. Religion is the spiritual life springing up in the soul, the union with the divine, which manifests itself through the moral life. The spiritual life is no mere subjective fancy, but is the true reality, more real and abiding than the world of sense and matter.

In philosophy, the Cambridge Platonists were idealists, emphasizing the reality of the ideal essences of things and the highest truth and reality that these possess, both in the intellectual and moral sphere, as opposed to what is material and sensuous. Cudworth, who was the most learned and, in many respects, the most important representative of the school, names his two chief works 'The True Intellectual System of the Universe,' and 'The Eternal and Immutable Principles of Morality.' From these titles the general standpoint of the whole movement appears. Cudworth was acquainted with the writings of Descartes and corresponded with him on philosophical subjects, but the real inspiration of the school came from Plato and Neo-Platonists like Plotinus, Proclus, Hierocles, all of whom are abundantly quoted in uncritical fashion. Negatively, too, their thought and activity were influenced greatly by Hobbes (q.v.), who stands for materialism and for relativity and a naturalistic system of ethics. Indeed the work of Cudworth and Henry More, the two most prominent writers of the school, may be said to be explicit attempts to refute Hobbes. Cudworth's work is the more ponderous and learned, abounding in quotations drawn from many sources. In More we find a more mystical tendency, with perhaps deeper speculative insight.

Bibliography.—Tulloch, J., 'Rational Theology and Christian Philosophy in England in the Seventeenth Century' (Vol. II, 2d ed., 1874); Hallam, H., 'Introduction to the Literature of Europe'; Sidgwick, H., 'An Outline History of Ethics'; Erdmann, 'History of Philosophy.' In addition, many of the writings of representatives of the school are accessible in English form.

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CAMBRIDGESHIRE, England, an inland eastern county of England; greatest length, about 48 miles; breadth, 33 miles; area, 858 square miles. Arable land, meadow and pasture constitute about three-fourths of the county, the rest being fens. The surface is marshy, flat and thinly wooded, except in the southern portion, which is somewhat elevated and on the chalk formation. The northern section forms part of the Bedford Level. The principal watercourses are the Lark River, the Nene, which borders the county on the north, and the Ouse, which crosses the middle of the county from west to east, with its tributary, the Cam. All of these are navigable for some distance. For parliamentary purposes the county is divided into three divisions (northern or Wisbech, western or Chesterton, and eastern or Newmarket) and embraces also the parliamentary borough of Cambridge, each of which returns one member. Cambridge University also returns two members. In the higher sections beans and wheat are produced; the black, spongy soil of the fens, when drained and burned, in dry years, produces large crops of wheat, oats, barley, potatoes, cole-seed, hemp, hay and flax; fine butter and cream-cheese are produced on the meadows of the Cam; and the Isle of Ely, a part of the fen-tract and within the Bedford Level, is noted for its garden vegetables. Cattle and sheep are reared on the thin chalky soils, and horses, cattle, sheep and pigeons on the fens. The manufactures are mostly confined to articles used in the agricultural industry; apart from that, brewing and malting are the chief industries, and there are paper and parchment mills, and coarse earthenware and needles are manufactured. Cambridgeshire was anciently the seat of a powerful tribe, the Iceni. There are interesting Roman remains, and the county is specially rich in ecclesiastical buildings replete with architectural, historic interest. Pop. 198,074.

CAMBRONNE, käṅ-brōn, **Pierre Jacques Étienne**, Count of, French general: b. Saint Sebastian, near Nantes, 26 Dec. 1770; d. 5 March 1842. He served on the national guard in the Vendée in 1792; distinguished himself by the capture of a Russian battery at Zürich in 1799; and took part in the campaigns in 1806–13. He went to Elba with Napoleon, and returned with him in 1815. Napoleon made him general and gave him the rank of count. At the battle of Waterloo he commanded a division of the Old Guard, and is credited with having made the famous reply to the demand for surrender, *La garde meurt et ne se rend pas* («The guard dies, but never surrenders»). It is now certain, however, that he did not say this, but gave himself up as a prisoner to General Halkett, and was taken to England. At the time of the restoration of the Bourbons he was on the list of proscriptions, but was exonerated by two court-martials, and in 1820 appointed commandant of Lille by Louis XVIII.

CAMBUSCAN, a prince of Cambaluc (Peking), whose name is a corruption of Genghis Khan, while the description applies apparently to his grandson, Kublai Khan. This was Milton's form of the Cambynskan of Chaucer's fragment of a metrical romance, 'The Squieres Tale.' Spenser continues and finishes the tale in his 'Faerie Queene' (IV, ii and iii); and John Lane, a friend of Milton's father, also wrote a continuation. Some of the romantic elements in it are widespread in Oriental story, occurring in the 'Arabian Nights,' the 'Panchatantra' and elsewhere.

CAMBYSES, kăm-bī'sēz, **I**, Persian king. His historical character is involved in great doubt, but he is commonly identified as the son and successor of Teispes, and father of Cyrus the Great (q.v.).

CAMBYSES II, king of the Medes and Persians: d. 522 B.C. He was the son of Cyrus the Great, and grandson of Cambyses I, and became, after the death of his father, king of the Medes and Persians, 529 B.C. In the fifth year of his reign he invaded Egypt, killed King Psammetichus III at Pelusium, plundered Memphis, and conquered the whole kingdom within six months. He now wished to send a fleet against Carthage, to conquer Ethiopia, and to obtain possession of the temple of Jupiter Ammon. The first of these expeditions, however, did not take place, because the fleet, which was manned with Phœnicians, refused obedience to him in a war against their kindred. The army which was sent against the Ammonites perished in the desert; and the troops, at whose head he himself had set out against the Ethiopians, were compelled by hunger to retreat. From this time he gave himself up to the greatest cruelties. On his entrance into Memphis, seeing the Egyptians engaged in the celebration of a feast in honor of their god Apis, whom they had found, he believed that they were rejoicing at his misfortunes. He caused the holy bull to be brought before him, slew him with his own sword and caused the priest to be scourged with rods. To drown his remorse he indulged in wine. No relation was held sacred by him when intoxicated. He caused his brother Smerdis, a dream concerning whom had disturbed him, to be murdered. His sister and wife Atossa, who lamented the death of Smerdis, he killed with a blow of his foot. These and other acts, almost indicating insanity, had irritated his subjects. A magian availed himself of his discontent, and obtained possession of the throne under the name of Smerdis, whose death had been concealed. Cambyses had resolved to go to Susa, in order to punish him, when, according to the account of Herodotus, as he was mounting his horse, he received a wound in the hip from his sword, in consequence of which he soon died, at Ecbatana, Syria, leaving no children. Somewhat different accounts are given by Ctesias and others. See Cyrus; Darius; Media; Persia. Consult Lincke, ‘Kambyses in der Sage, Litteratur und Kunst des Mittelalters’ (in Eber's ‘Festschrift,’ Leipzig 1897).

CAMDEN, Charles Pratt (1st Earl of), English statesman: b. 1713; d. London, 18 April 1794. After studying at Eton and King's College, Cambridge, he entered as a student at Lincoln's Inn, and in due time was called to the bar. In 1754 he was chosen member of Parliament for the borough of Downton. After acquiring great reputation as an advocate, he was, in 1757, appointed attorney-general, having the same year been elected recorder of the city of Bath. While he held the office of chief justice of the common pleas Wilkes was arrested on a general warrant as the author of the ‘North Briton.’ He was committed to the Tower as a state prisoner; and being brought, in obedience to a writ of habeas corpus, before the Court of Common Pleas, Chief Justice Pratt discharged him from his confinement on 6 May 1763. The behavior of the judge on this occasion, and in the consequent judicial proceedings between the printers of the ‘North Briton’ and the messengers of the House of Commons, and other agents of the ministry, was so acceptable to the metropolis that the city of London presented him with the freedom of the corporation, in a gold box, and requested to have his picture. In July 1765 he was raised to the peerage, by the title of Baron Camden; and about a year after made lord chancellor. In this capacity he presided at the decision of a suit against the messengers who arrested Mr. Wilkes, when he made a speech, in which he stated that «it was the unanimous opinion of the court, that general warrants, except in cases of high treason, were illegal, oppressive and unwarrantable.» On his opposing the taxation of the American colonies, he was deprived of the seals in 1770. He came into office again as president of the council, under the administration of the Marquis of Rockingham, in March 1782; on whose death, he resigned the following year. He soon after, however, resumed his place under Mr. Pitt, and in 1786 was made Earl Camden and Viscount Bayham. His popularity was very great in the American colonies, as is shown by the many counties, towns and villages named in his honor.

CAMDEN, William, English antiquary and historian: b. London, 2 May 1551; d. Chiselhurst, Kent, 9 Nov. 1623. He was educated at Christ's Hospital and Saint Paul's and Oxford. In 1575 he was appointed second master of Westminster School, and at this time began to make collections for his greatest work the ‘Britannia,’ written in Latin and giving an account of the British Isles from the earliest ages. It was published first in 1586, and gained a high reputation at once. It was revised and enlarged by the constant work and study of Camden, and by 1607 had passed through six editions. In the same year it was translated into English by Philemon Holland; by Edmund Gibson in 1722 (2 vols.); by Gough and Nicols (2d ed., 1806). Hume, in his ‘History of England’ ranks Camden's works among the best historical productions composed by any Engishman.

In 1593, Camden became head master of Westminster, for which school he drew up a Greek grammar (1597). The same year he obtained the office of Clarencieux King-at-Arms. In 1622 he founded a professorship of history at Oxford which he endowed with the valuable manor of Bexley in Kent. He was buried in Westminster Abbey. His house at Chiselhurst was the residence of Napoleon III (1871–73). His other works consist of ‘Annales Rerum Anglicarum et Hibernicarum regnante Elizabetha, ad annum salutis’ (1559, latest ed., 1717). ‘A Collection of Ancient English Historians’ (Frankfort 1603, 6th ed., 1607); ‘An Account of the Monuments and Inscriptions in Westminster Abbey’ (1600); ‘Narrative of the Conspiracy called the Gunpowder Plot’ (1607) written in Latin at the King's command.

CAMDEN, Ala., town and county-seat of Wilcox County, on the Louisville and Nashville Railroad, 60 miles southwest of Montgomery. The centre of the fertile «Black Belt of Alabama,» it has cotton, cottonseed oil, stock raising and lumber interests. Pop. 648.

CAMDEN, Ark., city and county-seat of Ouachita County, 115 miles southwest of Little Rock, on the Rock Island, the Southern, the Saint Louis and Iron Mountain and other railroads and on the Ouachita River. The city has a library and courthouse, machine shop, cottonseed-oil mills, lumber mills, sashes and door factories, spokes, wagon works and a cotton compress. There is a large river trade in cotton, lumber, poultry and live stock. Pop. 3,995.

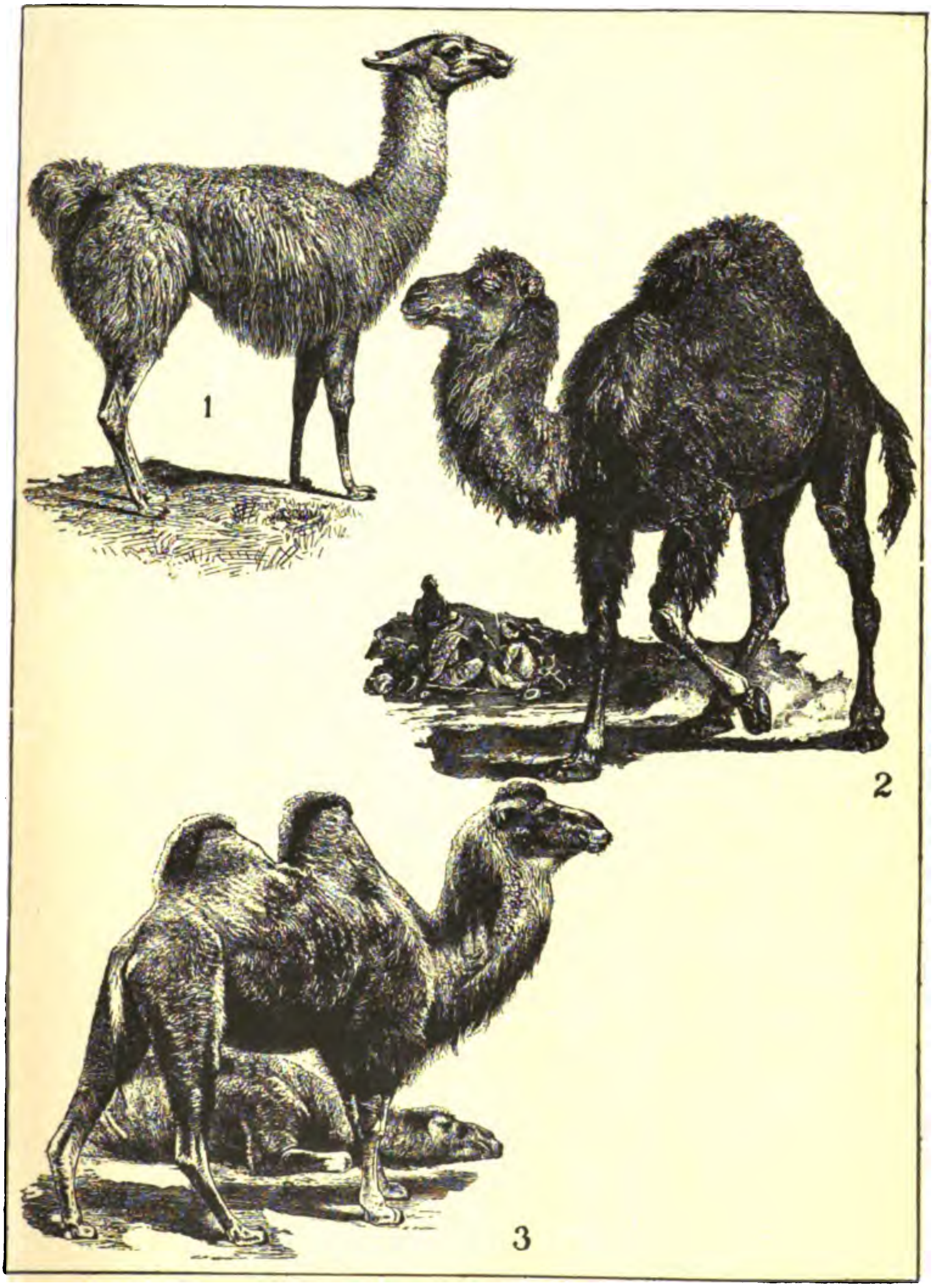
CAMDEN, Me., town and summer resort 37 miles southeast of Augusta, served by the Eastern Steamship Company's vessels. Besides its summer trade it has important wool and felt manufacturing interests. Pop. 3,015.

CAMDEN, N. J., city, port of entry and county-seat of Camden County, on the Delaware River, opposite Philadelphia, with which it is connected by several ferries. The city is situated on a level plain and the streets cross one another at right angles. It is noted for its immense market gardens and important manufactures and is the site of several large shipbuilding concerns. Area, five square miles. According to the latest Federal census Camden had 817 manufacturing establishments, employing $30,000,000 capital and 20,000 persons; paying $10,000,000 wages. The most important industries are foundry and machine-shop-products, ship-building, worsted goods, oil cloth, boots and shoes, masonry, textile fabrics, talking machines, soups, pens, iron mills, etc. The United States census of manufactures for 1914 recorded 343 industrial establishments of factory grade, employing 25,727 persons, of whom 22,490 are wage earners, receiving annually $12,967,000 in wages. The capital invested aggregated $101,433,000, and the year's production was valued at $71,405,000: of this, $35,436,000 was the value added by manufacture. There are nine banks with a combined capital of $3,000,000. The assessed value in 1915 exceeded $80,000,000, and the tax rate was $2 per $100. In 1917 there were in the city more than 200 miles of paved streets, 60 miles of sewers, 115 miles of water mains; and gas and electric street lighting and waterworks plants, the latter owned by the city. The notable buildings are the city hall, county buildings, hospitals and churches. At the close of the school year 1915 there were 38 public school buildings, 20,000 pupils, 510 teachers, a public and private high school. The city was settled in 1681 by William Cooper and was incorporated as a city under an act passed 14 Feb. 1828. Pop. 102,465.

CAMDEN, S. C., town and winter resort, county-seat of Kershaw County, at the head of navigation on the Wateree River, and on the Atlantic Coast Line, the Southern and the Seaboard Air Line systems, 32 miles northeast of Columbia. In a fertile, productive region, it has manufactures of cotton cloths, yarns and oil, bricks and lumber articles, and trades in naval stores, cotton and rice. Quakers from Ireland settled here in 1750 and received a town charter in 1791. Here 16 Aug. 1780, Baron De Kalb was mortally wounded during the victory of the British under Lord Cornwallis over the Americans under General Gates; and here 25 April 1781 the British under General Rawdon drove back the Americans under General Greene at the battle of Hobkirk's Hill. During the Civil War, General Sherman's troops 25 Feb. 1865 sacked and almost totally destroyed the town. Pop. 3,569.

CAMDEN, Battle of, a battle fought near Camden, S. C., 16 Aug. 1780, between the American troops under Gates and the British under Lord Rawdon. Shortly after the British captured Charleston in May, all South Carolina was in their hands except for the guerrilla warfare of Marion, Sumter and others. Washington had already sent De Kalb (q.v.) with 1,400 Maryland and Delaware regulars, among the best troops in the army, to save it, but the new disaster called for fresh efforts and a first-rate new commander of the Southern Department to succeed Lincoln. Washington wished to send Greene; but a popular clamor for Gates, mistakenly credited with the victory over Burgoyne, led Congress to give him the post. He took command at Hillsborough, N. C., where De Kalb was vainly waiting for General Caswell and the North Carolina militia to come up from South Carolina. Gates, therefore, determined to march south and join Caswell, and thus reinforced, seize Camden and the Wateree, near which was their camp — the strategic centre of the State, and the converging point of the chief northern roads. It was held by Lord Rawdon with a comparatively small force. A fortnight's starving march of 150 miles, in the course of which he picked up a company of Virginia regulars and the North Carolina men, brought him in front of Rawdon, strongly posted across the road 15 miles northeast of Camden. He might either attack with superior forces or hold Rawdon with a part while he sent the rest around his flank to seize Camden in the rear; but he did neither, and, after waiting two days without apparent object, moved west to Clermont, or Rugely's Mill, a strong position, 13 miles north of Camden. Here he was joined by 700 Virginia militia, but sent off 400 of his splendid Maryland regulars to help Sumter cut the British communications far to the southeast, and Cornwallis joined Rawdon, giving the British 2,000 trained men. Gates had no intelligence department, and supposed he still had only Rawdon's small force before him; and about 10 P.M. of 15 August started down the road to surprise Rawdon, Cornwallis at the same hour starting north to surprise him. The vanguards met about 3 A.M. a few miles above Camden, and the Americans were routed; but some British prisoners informed Gates that Cornwallis was in front with 3,000 men. Gates had 3,052, most of his nominal force being on paper or helpless with dysentery; and over half of them were militia who had never been under fire and did not even understand using a bayonet. De Kalb, the brave but judicious officer, wished to fall back on Rugely's Mill; but the other officers thought it too late to retreat, and Gates deployed his men, with as bad judgment as the decision to fight at all. The road ran through a level field flanked by swamps, so that everything depended on the firmness of the front rank; but he massed all the regulars on one wing and all the militia on the other. De Kalb held the right opposite Rawdon, with the Delaware regiment and the 2d Maryland brigade in front, the 1st Maryland in reserve; the left wing had the Virginia militia in front and the North Carolina troops in the rear, opposed to Col. James Webster, with Tarleton's cavalry in reserve. Gates' tactics were as ill-judged as his arrangement; he ordered the first charge made by the Virginia men, who did not even know how to march in order. They became tangled and while trying to reform, Webster's onrush broke them in wild panic; they threw down their loaded guns with bayonets set, without firing a shot, and ran to the rear. One regiment of North Carolina men fired several volleys, but all the rest fled like their neighbors, and the one exception soon shared their flight. Meantime, the 2d Maryland twice drove back Rawdon, then broke his ranks with a bayonet charge,

CAMELIDÆ



1 Guanaco 2 Dromedary 3 Two-Humped Camel

and held the field. But Webster and Tarleton, following the routed mob, had flanked the 1st Maryland and after an obstinate fight crowded it off the field; and, taking the 2d Maryland in the rear, compelled it, too, to retire, after a fierce resistance. De Kalb fought to the last, and was captured, mortally wounded, with 11 wounds. The stubborn fight of the regulars is shown by the fact that the Delaware troops were nearly annihilated, and the Maryland regiments lost nearly half their number. There were about 1,000 killed and wounded, and as many prisoners taken, with seven cannon and 2,000 muskets. The British lost 324. For the time the American cause in the South was at an end. Gates escaped to Hillsborough, but was shortly supplanted by Greene, who wrought a wonderful transformation in a few months.

CAMDEN SOCIETY. An English association established in 1838 at London, for the purpose of publishing historical and antiquarian information, named in honor of William Camden. Its publication began in 1847, the first series including 10 volumes. The second series up to 1900 included 63 volumes. In 1901 a new series was begun. Up to 1913, 23 volumes have been published.

CAMDEN TOWN, England, a district of London in the Metropolitan borough of Saint Pancras and county of Middlesex. It takes its name from the Earl of Camden who acquired property here bv marriage. The houses, which are in general of recent erection, are regular and substantial buildings. The district lies northeast of Regent's Park and north of the Euston station of the London and North Western Railroad.

CAMEL, a large ruminant of the genus *Camelus,* family *Camelidæ* (q.v.), two species of which have been domesticated since prehistoric times, and used as riding-animals and beasts of burden in the desert regions of the Old World. Although much search has been made, no wild species of camel can be found except one small two-humped variety, discovered by Prejevalski, which inhabits central Asia, northward to Siberia, but it is not certain whether it represents an original wild species, or is a degenerate race long ago escaped from domestication.

The Arabian camel (*Camelus dromedarius*) has one hump on the shoulders; the Bactrian camel (*C. bactrianus*) two. These are composed of muscle, flesh and fat, which in times of famine is reabsorbed to a large extent. After it has been exhausted, a rest of three or four months, with abundance of food, is necessary to restore it. The former is the more common species, and is used from Mongolia and northwest India throughout south-central Asia, Asia Minor, Arabia and northern and eastern Africa, and to a small extent in Spain and elsewhere. At the time of the rush of gold-seekers to California about 1850, efforts were made to naturalize camels in the arid regions of the southwestern United States, as a means of carrying supplies to the army posts there, but they proved unsuccessful, mainly by reason of their intractable and vicious disposition.

The original home of the single-humped camel is uncertain, but as it is better adapted to a sandy region than is the Bactrian species, it is thought to have been in the Sahara or Arabian desert. Its peculiar adaptability to life in sandy regions is noticeable in many ways. The callous cushions (pads) on its feet are repeated upon the chest and the joints of the legs, on which it rests when rising, kneeling or lying down, and protect these parts from abrasion by the sharp sand. Its wedge-shaped cutting-teeth are well fitted for cropping the short, shrubby plants of the desert. Its long eyelashes protect it from the glaring sun and from the drifting sand; and the ability to close the oblique nostrils at will prevents the entrance of dust. The most remarkable provision for life in arid regions, however, is found in the structure of the stomach, the interior of which has no villi on its surface. Both the compartments of the paunch contain a number of pouches or cells in their walls, each of which may be closed and separated from the remainder of the paunch. These are filled and closed when the camel drinks, and by these means it can store more water than is requisite for its immediate use, and so save up a store which may gradually be drawn upon during long journeys over waterless districts. The camel's senses of sight and smell are very acute, and it is capable of discerning water at a great distance. By reason of these qualities it has been a most important factor in the colonizing of the countries that lie south and east of the Mediterranean, Black and Caspian seas, and such oases or fertile areas as are separated by desert waters; in fact students of civilization believe that these regions could hardly have become the abode of a settled civilization had it not been for this useful animal.

The Bactrian camel is of smaller size and heavier build, and, by its harder and more cloven feet, and longer and finer hair, is better adapted to a rocky and cooler region. Its habitat is central Asia. Like the southern species it has wonderful endurance, withstanding the terrific summer heat of Persia and the Tibetan plains, and the Arctic cold of the passes of Hindu-Kush and Mongolia. They have been successfully employed as army transports by the English in northwestern India; and for many years, through all weathers, trains of these camels, sometimes of many thousands, were almost the only means by which tea and other merchandise was transported between China and Russia.

The many breeds of camel exhibit great diversity. Some are those bred only for the saddle, others as baggage-carriers or draft animals, for they are also trained to haul carriages in harness. Properly, a «dromedary» is any camel of either species of a saddle-breed, distinguished for its speed and ease of gait. As a beast of burden the camel has great powers of endurance. The Arabian species carries twice the load of a mule, while it is not unusual for the Bactrian species to carry half a ton weight upon its back; by reason of which it is sometimes poetically termed the «ship of the desert.» Caravans frequently contain as many as 1,000 camels, which move along at a steady and uniform pace of about two and a half miles an hour. When bred especially for the purpose they have been known to carry a traveler 100 miles a day. They move with a pacing motion, lifting the feet on the same side successively.

Their money value is about the same as that of horses of similar grade and purpose.

The camel serves the nomadic inhabitants of Arabia and the Sahara and the East in many ways besides as a riding animal or beast of burden. It gives them hair that may be woven into the coarse fabric for tent-covers and ropes, or the finer shawls and rugs that are often of great market value. Its milk and flesh are food and its hide and bones are utilized, while its dried dung serves as fuel when no wood is obtainable; and from its tracks, in reading which the Bedouins are amazingly skilful, the nomad derives information of interest and importance as to the movements of neighbors or the strategy of enemies. This animal forms an important element in the economy of the civilized people of those regions, in warfare as well as in agriculture and commerce. A camel-corps has long been a regular part of the organization of the British army in Egypt and in northeastern India, serving as effective cavalry.

CAMEL, a water-tight box or caisson, used to raise a sunken vessel or to float a vessel over a shoal or bar. Its invention is ascribed to the Dutch and its first use is said to have been about 1688. It is sunk by the admission of water and is attached to the vessel, after which the water is pumped out, and the camel, rising by its buoyancy, lifts the load. Modern camels are built of steel and fitted with machinery for working the chains which support the wreck or attach it to the camel.

CAMEL-BIRD, a book-name of the ostrich (q.v.).

CAMEL-CRICKET. See MANTIS.

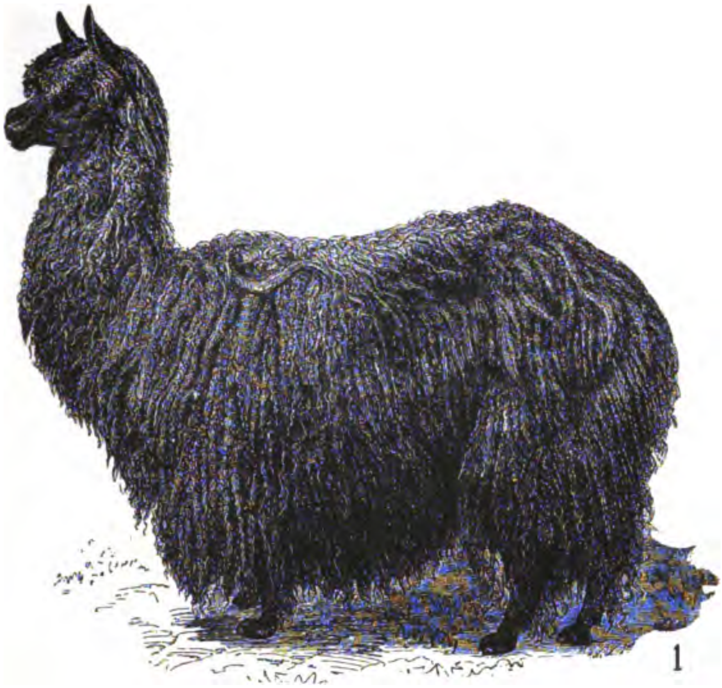
CAMELFORD, England, village on the Camel, 28 miles northwest of Plymouth. The streets are spacious and well paved, but the houses are in general very indifferent. Five miles to the northwest of Camelford are the ruins of King Arthur's castle of Tintagel, and about two miles to the north are the celebrated slate quarries of Delabole. The inhabitants are chiefly engaged in agriculture.

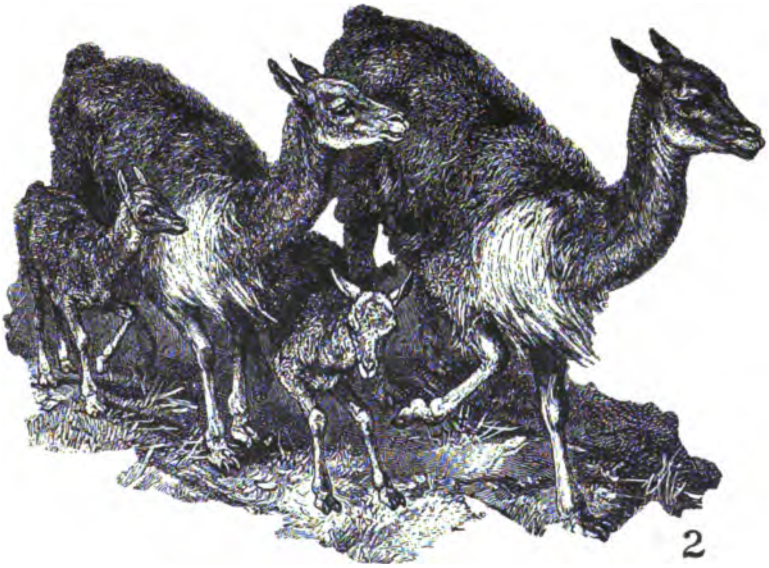
CAMELIDÆ, a family of ruminant mammals, including the Old World camels (genus *Camelus*) and New World guanacos and vicugnas (genus *Llama*), as the existing remainder of a divergent group formerly closely connected both in structure and in geographical distribution. It forms a distinct section of the *Ruminantia* named *Tylopoda,* in reference to the character of the feet, in which only the third and fourth toes are developed, and these are embedded in a cutaneous pad, forming a broad elastic sole to the foot. The two metapodial or «cannon» bones of each of the long limbs are separated for a considerable distance at the lower end, where the articular surfaces, instead of being pulley-like, with deep ridges and grooves, as in other recent split-hoofed animals (*Artiodactyla*), are rounded and smooth. The toes terminate in small nails, and the weight of the animal rests upon the padded sole of the foot instead of on hoofs, in adaptation to the soft, sandy soil of deserts, in which this race of animals seems to have lived ever since its origin. The dentition of the prolonged jaws has certain peculiarities. The full number of incisors is present in youth, but in the upper jaw these disappear, except the outermost, which persist through life, while those in the lower jaw are procumbent. Canines are present in both jaws. The molars are of the selenodont type. The neck is very long and flexuous; the shoulders are high; and the hinder part of the body is much contracted and drooping in appearance. The tail is well developed and the skin is clothed with long, shaggy hair. The nostrils are high and may be closed against the admission of dust; and the lips are prolonged and flexible. There are no horns or antlers in either sex. The interior anatomy is peculiar, principally in the character of the digestive organs, described in the article CAMEL. See CAMELIDÆ, FOSSIL.

CAMELIDÆ, Fossil. The evolution of the camel (q.v.) through the Tertiary and Quaternary periods is nearly as completely known as that of the horse, and is hardly less instructive. The camels now inhabit central Asia and northern Africa, the llamas, South America. No fossil camels or llamas are found in these countries in deposits much older than the Quaternary. But in the Tertiary strata of North America have been found a series of animals which appear to be the direct ancestors of this family, and connect them with the primitive hoofed animals of the earliest Eocene. The earliest member of this series, ancestral probably to the camels among other ruminants, is *Trigonolestes* of the Lower Eocene, smaller than a cotton-tail rabbit, with the complete series of incisor, premolar and molar teeth, the molars of the primitive bunodont type (see BUNODONT) and probably five complete toes, the side toes very slender, and the metapodials all separate. In the Upper Eocene stage, *Protylopus,* as large as a jack-rabbit, the molars have become selenodont (q.v.), as in modern camels, but with shorter crowns, and the side toes in the hind leg are represented only by splints. In the Oligocene stage, (*Poëbrotherium*), as large as a gazelle, the molars have longer crowns, the splints are reduced to small nodules of bone and the metapodials, though still separate, are closely appressed. In the Miocene stage (*Procamelus,* etc.) the metapodials are sometimes separate, sometimes united; the incisors and premolars are generally reduced in size and the anterior upper incisors are often lost; and the form of the teeth and skull comes closer to the modern type. The Pliocene camels (*Pliauchenia,* etc.) are still closer to the modern type, all with united metapodials and reduced incisors and premolars, and at this epoch they spread to South America and the Old World, the gradual rising of the continents having made land connections between them about this time. During the Pleistocene epoch the camels all became extinct in their original home, although they still survive in the alien continents to which they had wandered.

The most remarkable peculiarity of the camels is the adaptation of the stomach, which enables the animal to go a long time without water (see CAMEL); palæontology gives no direct evidence of the evolution of this character. But the cushioned foot, equally an adaptation to desert life, is not indicated (by the form of the toe bones) in any ancestral camel pre-

CAMELIDÆ





1 Alpaca **2 Vicuna**

vious to the Miocene, from which time it became gradually more marked. We may suppose, therefore, that the earlier ancestors of the camel were antelope- or deer-like in their habitat, and were gradually adapted to desert life.

Besides the main line of descent there were, especially in the Miocene, side branches now extinct, one of which (*Alticamelus*) was singularly giraffe-like in proportions, although not related to the giraffes, which were evolved in the Old World at the same epoch.

It is a general law in the evolution of any race of animals that at each succeeding stage in its development the progressive characters appear at an earlier period in the lifetime of the individual. The young individuals of one stage resemble the adults of the preceding stage, while the old individuals take on some of the characters of that next succeeding. This is well illustrated in the camels, especially of the Miocene epoch; in young individuals the metapodials are always separate, as they are in all adult camels of the Oligocene, and they are usually not completely consolidated until a comparatively advanced age. In modern camels and llamas they are consolidated before birth. The anterior incisors and premolars usually drop out in old individuals of Miocene camels; in the later stages they are minute stumps or scales which disappear early in life.

CAMELLIA, kạ-mĕl'yạ, a genus of plants belonging to the family *Ternstrœmiaceæ*, beautiful flowering shrubs, natives of Asia. The name Camellia was given to this genus by Linnæus in honor of Kamel or Camellus, a Moravian Jesuit. *Camellia japonica*, as it grows in the woods and gardens of Japan and China, is a lofty tree of beautiful proportions, and clothed with a deep green, shining foliage, with large, elegant flowers, either single or double, and of a red or pure white color. There are numerous varieties of this species in China, the greater part of which have found their way to Europe and America, while other new varieties have been produced by breeding. The double-white, double-striped and double-waratah, the last so called from the central petals resembling those of the waratah plant of Australia, are considered the finest varieties, and both grow and flower well. The peony-flowered and fringed are also much admired. The oil-bearing camellia (*C. sasanqua*) is cultivated for its seeds, from which an oil is expressed that is very generally used by the Chinese in their cookery. It thrives best in a red sandy soil, and attains a height of six to eight feet, producing a profusion of white blossoms and seeds. Besides these species *C. reticulata* is cultivated.

The single red camellia is propagated by cuttings, layers and seeds. It forms suitable stocks, on which the others are either inarched or budded and engrafted. The cuttings to be selected are the ripened shoots of the preceding summer; these are taken off in August, being cut smoothly at a joint or bud; two or three of the lower leaves are taken off, and the cuttings then planted firmly in the soil with a dibble. Inarching or engrafting is performed early in spring, when the plants begin to grow. A few seeds are sometimes obtained from the single red and semi-double camellias, and from the single waratah. These require two years to come up, but make the best stocks of any.

CAMELOPARD. See Giraffe.

CAMELOPARDALIS, one of the northern circumpolar constellations added by Hevelius in 1690. It is a large, irregularly shaped constellation, something like the animal, and is more than 40° in length, with its head close to the North Pole. It borders upon Ursa Minor, Draco, Ursa Major, Lynx, Auriga, Perseus, Cassiopeia and Cepheus. It contains no stars brighter than the fourth magnitude, and was put in to fill up a part of the sky otherwise uncovered by constellations. Being introduced later than Bayer's time, it has no letters except α, β, and γ, which Baily introduced into the «B. A. C.» in 1845. While these have not been universally accepted by astronomers, they will probably be adopted in a general revision of the northern constellations.

CAMELOT, in the Arthurian legends, the city where King Arthur's palace with the Round Table was located. Tennyson, in ‘The Coming of Arthur,’ describes the city and the royal court, and mentions it in others of the ‘Idylls of the King’ and in ‘The Lady of Shalott.’ It is also referred to by Shakespeare in ‘King Lear.’ The site of Camelot has been much in dispute; Shakespeare supposed it to be in Somersetshire; Tennyson and Capell located it at or near Winchester; and Caxton placed it in Wales. The monks of Glastonbury were chiefly responsible for the Somerset theory, which they maintained for the purpose of attracting thither pilgrims and so enriching their monastery.

CAMEL'S HUMP, one of the peaks of the Green Mountains, in Vermont, 17 miles west of Montpelier. Its height is about 4,100 feet.

CAMEL'S-THORN, a genus of plants belonging to the family *Fabaceæ*. They are herbaceous or half-shrubby plants, with simple leaves, minute stipules, axillary peduncles terminating in spines, and red flowers arranged in racemes. Only three species of this genus are known, *Alhagi camelorum*, *A. græcorum* and *A. maurorum*. They grow in the deserts of Egypt and the East, and their common name is derived from the fact that they afford a food much relished by camels. The species yield a gummy, saccharine exudation like manna.

CAMEN. See Kamen.

CAMEOS. Certain carved reliefs on stones, shells or other substances in which the engraver takes advantage of the medium having two or more super-imposed layers or stratifications of different colors or tones to obtain the most striking effect. The derivation of the word is contested. The late Rev. Charles King, one of the most prominent collectors and authorities, says the term comes from the Arab word *camant*, a flower, and it was used since the Crusades. He says the term *camahutum* (from the Syriac *chemeia*, a charm) first appears in the 13th century. In early times the cameo has also been termed *cadmeus* and *cameus*. In most cameo examples the relief or subject is composed from the upper layer and the lower layer is utilized as background. The substance used covers a wide range, among others: Agate, onyx, sardonyx, opal, amethyst, emerald, aquamarine, carbuncle, jacinth, chrysolite, lapis, garnet, turquoise, jasper, beryl, hematite, malachite, amber, mother-of-pearl, coral, and the shells, *strombus gigas, cassis rufa, cassis tuberosa*, etc. The «nicolos» are artificially treated stones (heat or acid action). Glass plates were also used in ancient Greek art as a medium; one example by Dioscorides' son, in Vienna, is a portrait of Augustus. The «Portland» vase (q. v.), in the British Museum, is another. The paste was usually of blue ground with a white upper layer for the engraved subject. Antique cameos had their work done with a bow-drill. It is rare to find cameos engraved on the rear as well as the face side; some exist, however, and the Paris Bibliothèque Nationale possesses one with Agrippa on one side and Julia on the other. The connoisseur usually classifies antique cameos as mythological, symbolic and heroic; frequently they are also divided into periods.

The uses to which cameos have been put are quite numerous. The ancients ornamented vases, hair ornaments, bracelets, brooches, even furniture with them. The knight fastened them upon his armor, small ones were worn as amulets. In the Middle Ages they were lavished upon reliquaries, chalices, crosses, in the church. A peculiar condition that prevailed in the early Christian times was the adaptation of stones having pagan engravings to Biblical subjects. Thus they took Jupiter for Saint John the Evangelist because of the accompanying eagle attribute. Another peculiar fact is that cameos in olden times were rarely set in rings, although there are a few such Roman and others of the Renaissance period. The subjects treated in cameos are mostly faces terminating at the base of the neck, entire figures and groups. Of the former there are some containing two profiles superimposed, the upper one receding so as to expose the one beneath. Such heads are termed *conjoined*, and the pieces are known as *baijoires*. The ruler and his consort are often so treated. The cameos of the noted Greek Dioscorides are marvels of art and execution as also those signed Glycon, of whom the Cabinet de France, Paris, possesses an Amphitrite. This cabinet also has a signed Evodus example and other cameos such as the Minerva and Neptune (known to the Middle Ages as Adam and Eve), the Apotheosis of Germanicus, Triumph of Licinius (4th century), Apotheosis of Augustus (imported from the Orient in the 13th century), the Grande Camée (or cameo of Sainte Chapelle), a cameo of five layers, measuring 30 centimeters by 26, on which are engraved the Apotheosis of Augustus, the Family of the Cæsars and Group of Captives and Warriors. On the Byzantine cameos we find Agnostic symbols and such early Christian monograms as IC-XC (Jesus Christ), KC (Saviour), etc. The wonderful Tazza Farnese, now in Naples, is a Renaissance work from the Lorenzo de Medici collection. The Renaissance, besides its other art giants, brought forth great cameo artists. Domenico of Milan, called Domenico dei Camei (of the Cameos) was engraver to the Medicis; Giovanni delle Corniole (also of the 15th century) received his title Carnelian from his work in this gem stone; Matteo dal Nasaro, of Verona, followed François Premier (early 16th century) to France where he did very fine portraits in cameo. The French engraver Julien de Fontenay, known in art as Coldoré, did such splendid work that Queen Elizabeth employed him at her English court, where he produced her portraits in turquoise and onyx (one is in the Victoria and Albert Museum, London, another in the Cabinet de France, Paris). Henri IV was extremely infatuated with cameos and wore 12 of them as buttons (they represented the 12 Cæsars), also a cameo in his sword, all of which are in the Cabinet de France. Among the noted family of Pichlers, gem engravers who did fine cameo work, are Giovanni, of Florence, and Luigi, second son of Antonio; the latter was Austrian court engraver under Francis I. In the 17th century the cameo was so much in vogue that the celebrated Flemish artist Rubens designed a number of copies of antiques. In the 18th century Jacques Guay, of Marseilles, did beautiful work; Jean Laurent Natter, of Nuremberg, was great in imitating antiques, and even the Marquise de Pompadour engraved and signed the Genius of Music cameo. Artist Bouché designed cameos and Louis Chapat, and the most noted cameo artist of all, Joseph Pichler, have left us very fine specimens of this glyptic art. The Simons (father and son), as well as Berini and Jeuffroy, belong to the well-known cameo artists of the 19th century. Bernardo Pistrucci did fine work in London. A Scotsman named James Tassie reproduced (late 18th century), to propagate art knowledge, beautiful copies in glass of antique cameos which are collected by connoisseurs of this day on their art merits; they are fetching $10 or more these days though sold originally at $2.50; their colors are very brilliant, but these pieces closely resemble antiques. Besides the collections in Paris already mentioned, there are extensive cabinets at Dresden, Vienna, the Saint Petersburg Hermitage Museum, Florence, Rome, Naples and London.

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CLEMENT W. COUMBE.

CAMERA, Photographic, a camera obscura so constructed that sensitized plates or films may be placed at the back and receive the image. There are many styles of camera in use, those of the tripod variety being used for portraits and landscapes where a time exposure is required and the hand camera for instantaneous exposures, used by tourists on account of its convenient shape and size. See CAMERA OBSCURA; PHOTOGRAPHY.

CAMERA LUCIDA (Lat. «light chamber»), an optical instrument employed to facilitate the sketching of objects from nature. It acts by total reflection, and may have various forms, of which that proposed by Wollaston, and illustrated in the accompanying figures, is one of the commonest. The essential part is a totally reflecting prism with four angles, one of which is 90°, the opposite one 135° and the other two each 67° 30′. One of the two faces which contain the right angle is turned toward the object to be sketched. Rays falling in a straight line on its face, as *x r*, are totally reflected from the face *c d* to the next face *d a*, whence they are again totally reflected to the fourth face, from which they emerge in a straight line. The eye (*pp*) placed so as to receive the emergent rays will see an image of the object in a direction of right angles to that in which the object lies. In practice the eye is held over the corner *a* of the prism in such a position that one-half of the pupil receives these reflected rays, while the other half receives light in a parallel direction outside the prism. The observer thus sees the reflected image projected on a real background, which consists of a sheet of paper for sketching. He is thus enabled to pass a pencil over the outlines of the image — pencil, image and paper being simultaneously visible. It is very desirable that the image should lie in the plane of the paper, not only because the pencil-point and the image will then be seen with the same focusing of the eye, but also because parallax is thus obviated, so that when the observer shifts his eyes the pencil-point is not displaced on the image. The introduction of an ordinary «stop» as used in photography remedies this defect, although greatly reducing the volume of light passing. As the paper, for convenience of drawing, must be at a distance of about a foot, a concave lens, with a focal length of something less than a foot, is placed close in front of the prism in drawing distant objects. By raising or lowering the prism in its stand (FIG. 2), the image of the object to be sketched may be made to coincide with the plane of the paper. The prism is mounted in such a way that it can be rotated about either a horizontal or a vertical axis; and its top is usually covered with a movable plate of blackened metal, having a semi-circular notch at one edge for the observer to look through.

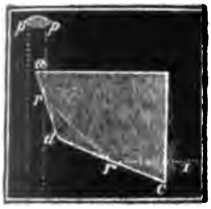


FIG. 1

Another form of the camera lucida, that of Amici, an Italian optician, is sometimes preferred to that of Wollaston, inasmuch as it allows the observer to change the position of his eye considerably without ceasing to see the image of the object he is tracing. The prism in this case is triangular in shape, and one of the angles is a right angle. In using it, the right angle is turned upward, so that one of the perpendicular faces is turned toward the object in an oblique direction, while the edge of the other perpendicular face meets a transparent glass plate at right angles. The rays from the object falling upon the face of the prism which is turned toward it are, after being more or less refracted, thrown upon the base of the prism, from which they are totally reflected in the direction of the other perpendicular face. In emerging from the prism of this face they are again refracted and thrown upon the transparent glass plate. By this, again, the rays are partially reflected, being thrown upward in the direction of the eye of the observer, who, looking through the plate, sees an image of the object on a sheet of paper beneath, the outlines of which can be traced by a pencil as before. Perhaps the most important use of the camera lucida is its adaptation and attachment to the microscope; but here also direct photography has almost wholly superseded handwork.

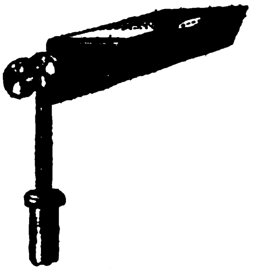
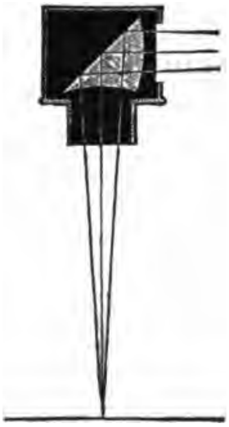


FIG. 2

CAMERA OBSCURA (Lat. «dark chamber»), an optical instrument employed for exhibiting the images of external objects in their forms and colors, so that they may be traced and a picture formed. From certain scattered observations in the writings of Friar Roger Bacon, in the 13th century, it would appear that he was acquainted with the principle upon which the camera obscura is constructed, but the first complete description of this instrument is found in the ‘Magia Naturalis’ of Giambattista della Porta, published in 1569, and Porta is commonly credited with its invention.



In its simplest form the camera obscura consists of a darkened chamber, into which no light is permitted to enter excepting by a small hole in the window-shutter. A picture of the objects opposite the hole will then be seen on the wall, or a white screen placed so as to receive the light coming through the opening. The images thus obtained become sharper as the size of the hole is diminished; but this diminution involves loss of light, so that it is impossible by this method to obtain an image at once bright and sharp. This difficulty can be overcome by placing a lens in the opening in the shutter. If the objects in the external landscape are all at distances many times greater than the focal length of the lens, their images will all be formed at sensibly the same distance from the lens and may be received upon a screen placed at this distance. The images are inverted, and are of the same size whether the lens is in position or not, so long as the screen remains fixed; but they are far sharper and more distinct when the lens is used. As an attraction at seaside resorts and other places of amusement, the camera obscura consists of a small building or of a tent surrounded by opaque curtains and having at its top a revolving lantern, containing a lens with its axis horizontal, and a mirror placed behind it at a slope of 45°, to reflect the transmitted light downward of a sheet of white paper lying on the top of a central table. Images of external objects are thus depicted on the paper, and their outlines can be traced with a pencil if desired. It is still better to combine lens and mirror in one by the arrangement represented in section in the figure. Rays from external objects are first refracted at a convex surface, then totally reflected at the back of the lens (or prism), which is plane, and finally emerge through the bottom, which is concave, but has a larger radius of curvature than the first surface. The two refractions produce the effect of a converging meniscus. The camera obscura, which was formerly chiefly employed for purposes of amusement, has now become well known from its adaptation to photography. See PHOTOGRAPHY.

CAMERARIUS, kä-mä-rä-rĭ-oos, **Joachim,** German classicist and educator: b. Bamberg, 12 April 1500; d. Leipzig, 17 April 1574. His proper name was Liebhard but he changed it to Camerarius, because his ancestors had been chamberlains (Lat. *camerarii*) at the court of the bishops of Bamberg. At the age of 13 he entered the University of Leipzig. In 1518 he began to teach Greek at Erfurt; in 1521 he taught at Wittenberg, where he became the friend of Melanchthon; and in 1541 he undertook a professorship at Leipzig, which he retained until his death. He contributed not only to the progress of knowledge by his own works and by editions of classical authors, but also by a better organization of the universities of Leipzig and Tübingen and of the gymnasium at Nuremberg. He took an important share in the political and religious affairs of his time, and in 1555 was deputy of the University of Leipzig to the Diet of Augsburg. His critical judgment was superior to that of Melanchthon, whose equal he was in classical studies, and he must be ranked as the greatest German classicist of his century. Together with many theological and biographical books, his works include editions of ‘Homeric Poems’ (with the so-called scholia of Didymus, Basel 1541); ‘Greek Elegiac Poets’ (Basel 1550); ‘Theocritus’ (Frankfort 1545); ‘Sophocles’ (Basel 1556); ‘Herodotus’ (Basel 1540 and 1557); ‘Theophrastus’ (Basel 1541); coeditor on ‘Galen’ (Basel 1538); ‘Quintilian’; ‘Cicero’ (1540); and several others. Consult Bursian, ‘Geschichte der klassischen Philologie in Deutschland’ (pp. 185–90, Munich 1883), and Sandys, ‘A History of Classical Scholarship’ (Vol. II, Cambridge 1908).

CAMERARIUS, Rudolph Jakob, German botanist: b. Würtemberg, 12 Feb. 1665; d. Tübingen, 11 Sept. 1721. To him is ascribed the discovery of the sexual relation in plants. He was in charge of the botanic gardens at Tübingen and was also a medical professor.

CAMERINO, kä-mä-rē'nō (ancient CAMERINUM), Italy, a town in the province of Macerata, 41 miles southwest of Ancona, between the Chienti and the Potenzi. It is the seat of an archbishopric dating from 1787, and contains some good public buildings, among which are the archiepiscopal palace, the ducal palace, the new palace and the cathedral built in 1832, occupying the site of a temple of Jupiter. There is a university, founded in 1727, and a bronze statue of Sixtus V, erected in 1587. Silk is grown and manufactured here. Pop. 11,689.

CAMERLENGO (It. *camerlingo,* "a chamberlain"), one of the highest officers of the Vatican court, who controls the finances and secular interests of the Pope. A cardinal camerlengo, during a vacancy in the Holy See, takes charge of all the temporalities, and presides over the apostolic chamber or palace. The other cardinals assist in spiritual offices. There is also a camerlengo of the sacred college of cardinals, and a camerlengo of the Roman clergy.

CAMERLYNCK, kă'mėr-link, **Achille,** Belgian sociologist and Biblical scholar: b. Reninghelst, Belgium, 9 May 1869. He was educated at Roulers, Bruges and at the University of Louvain. He was ordained to the priesthood in 1894, and from 1899 to 1910 was professor of Scripture and sociology at the Seminary of Bruges. In 1910 he became dean of Ostend and rector of Saints Peter and Paul, Ostend. He is a member of the Belgian Superior Council of Labor and the Belgian Society of Sociology. He is the author of ‘Saint Irénée et le canon du Nouveau Testament’ (1896); ‘De quarti Evangelii auctore dissertatio’ (2 vols., 1898–99); ‘Quelques considérations sur la base philosophique du socialisme scientifique contemporain’ (1900); ‘De l'opportunité d'une enquête ethnographique et sociologique sur les peuples incultes’ (1905); ‘Compendium Introductionis generalis in Sacram Scripturam’ (2 vols., 1911–13); ‘Evangeliorum secundum Matthæum, Marcum et Lucam synopsis’ (with Dr. Coppieters, 1908). He edited Van Steenkiste's ‘Commentarius in Epistolas Catholicas’ (5th ed., 1909) and ‘Commentarius in Actus Apostolorum’ (6th ed., 1910), and was a contributor to ‘Collationes Brugenses,’ ‘The Catholic Encyclopedia’ and ‘Annales’ de la Société Belge de Sociologie, etc.

CAMERON, Agnes Deans, Canadian educator, traveler and lecturer: b. Victoria, B. C., 1863; d. there 1912. She taught for 18 years and became widely known for her interest in exploration and national development, giving lectures in Canada, Great Britain and the United States, based on personal observation of the natural resources of Canada, during travels all over the little known country extending to the Arctic Ocean. She was elected vice-president of the Canadian Women's Press Club in 1909. She was associate editor of the *Educational Journal of Western Canada,* and author of ‘The New North’ (1909) and ‘The Outer Trail’ (1910).

CAMERON, Arnold Guyot, American educator: b. Princeton, N. J., 4 March 1864. He was graduated at Princeton University in

1886, and during the next two years studied abroad. In 1888–91 he was professor of French and German languages and their literatures in Miami University; in 1891–97 assistant professor of French in the Sheffield Scientific School of Yale University; and in 1897 accepted the chair of French at the John C. Green School of Science of Princeton University. He is editor of the textbooks 'Daudet,' 'Mérimée,' 'Loti,' 'Coppée and Maupassant' and 'The Goncourts,' and has lectured on literary topics.

CAMERON, Sir Charles, Scotch journalist and politician: b. Dublin 1841. He was educated at Madras College, Saint Andrew's, Trinity College, Dublin, and at medical schools in Paris, Berlin and Vienna. He edited the *North British Daily Mail* from 1864 to 1874, and from the latter year till 1900 was one of the members of Parliament for Glasgow. The adoption of six-penny telegrams was the result of a resolution which he introduced in the House, and he was likewise instrumental in the conferring of municipal franchise upon women in Scotland. He was knighted in 1893.

CAMERON, Sir Charles (Alexander), Irish physician: b. Dublin, 16 July 1830. He was elected public analyst for the city of Dublin in 1862. In 1867 he was elected professor of hygiene and chemistry in the Royal College of Surgeons in Ireland. He was knighted in 1886 in recognition of his services to public health. He has written 'Chemistry of Agriculture' (1857); 'Lectures on Public Health' (1868); 'History of the Royal College of Surgeons, Ireland, etc.' (1886); 'Elementary Chemistry and Geology' (1896); 'Reminiscences' (1913).

CAMERON, Charles Duncan, English soldier: d. 1870. He served in the Kaffir War (1846–47) and in the Crimean War at the defense of Kars. In 1860 he became British consul in Abyssinia. He undertook two years later to deliver a letter from Queen Victoria to King Theodore, and was imprisoned by the King for 14 months on the charge of interfering with the internal politics of that country. He was released only to be shortly imprisoned again, together with Rassan, agent of the British government, and others, their final release being effected by the advance of English troops upon Theodore's stronghold at Magdala in April 1868. An account of these matters by Cameron was published in the 'Parliamentary Printed Papers' (1868–69).

CAMERON, Sir Douglas Colin, Canadian knight and statesman: b. Hawkesbury, Ontario, 1854. He became a prosperous lumber capitalist with business interests in Manitoba, British Columbia and Ontario. He was prominent as a Liberal member in the Ontario legislature 1902–05, in 1911 received the appointment of lieutenant-governor of Manitoba and was knighted in 1914.

CAMERON, Edgar Spier, American mural artist: b. Ottawa, Ill., 26 May 1862. After early study and training in New York and Paris, he, with Walter McEwing and Robert Reid, were selected to execute the mural paintings for the Chicago World Fair. The decorations in the library of the Supreme Court, Springfield, Ill., are representative of his mural work, while distinctive easel work includes 'The Youth of Christ,' his most important work, 'Glass Blowers' and 'Dreamland,' exhibited at Berlin in 1910. From 1891–1900 he was art critic and correspondent of the Chicago *Tribune*, and at the Paris Exposition, 1900, was a member of the international jury. Marie Cameron, his wife, is well known for successful portraiture and genre work.

CAMERON, Frank Kenneth, American chemist: b. Baltimore, Md., 2 Feb. 1869. A student at Johns Hopkins University, after instructing at Cornell and at the Catholic University of America, he was associated with the United States Department of Agriculture and became head of the laboratory of soil chemistry. His technical writings include numerous departmental bulletins and 'An Introduction to the Study of the Soil Solution' (1910); and 'The Soil Solution, the Nutrient Medium for Plant Growth' (1911).

CAMERON, George Frederick, Canadian poet: b. New Glasgow, Nova Scotia, 1854; d. 1885. He was educated at Queen's University, Kingston, Ontario; resided for a time in the United States; returned to Canada, and edited the Kingston *News*. As a lyrical poet he received high praise from leading critics, his songs on Spanish oppression in Cuba being especially full of fire.

CAMERON, James Donald, American capitalist and politician: b. Middletown, Pa., 14 May 1833. He is the oldest son of Simon Cameron (q.v.), and was graduated from Princeton College in 1852. He devoted himself to business pursuits and in 1861 was made vice-president and two years later president of the Northern Central Railroad. He remained in this office till 1874. In 1876 President Grant appointed him Secretary of War, and in 1877 he succeeded his father as United States senator from Pennsylvania. He was re-elected in 1885 and 1890. He retired in 1897. He was prominent in the campaign of 1876, first as opposing the nomination of Blaine, and then in working for Hayes' election. But Hayes refused to continue him in the Cabinet. In 1880 he was chairman of the Republican National Committee. Consult McClure, 'Old Time Notes of Pennsylvania' (Philadelphia 1905).

CAMERON, John, Scottish scholar: b. Glasgow 1579; d. there, 13 May 1625. He was educated at the University of Glasgow, and at the age of 20 held an appointment there as reader in Greek. In 1600 he went to the Continent, where his ability and erudition secured for him several appointments at Bergerac, Sedan, Saumur and other seats of learning. Returning to Great Britain in 1620, he was two years later appointed principal of the University of Glasgow; but in less than a year returned to Saumur, and thence to Montauban, where he received a divinity professorship. Here, as at Glasgow, his doctrine of passive obedience made him many enemies, by one of whom he was stabbed in the street, and he died from the effects of the wound. Sir Thomas Urquhart styles him a "walking library," and Milton, "an ingenious writer in high esteem." He was considered one of the best scholars of his day; in Biblical criticism he was inclined to be perverse; where there was a difficulty he usually chose the opposite view to that held by other divines, especially Beza. His theological opinions were of a somewhat lax character, his eight works, in Latin and French (10 vols., 1616–42) being said to be the foundation of Moses Amyraut's doctrine of universal grace (1634). His followers are sometimes called Cameronites. His collected works were published with a memoir by L. Cappel (Geneva 1642).

CAMERON, Sir **Matthew Crooks,** Canadian statesman and jurist: b. Dundas, Ontario, 1822; d. 1891. He was called to the bar of Upper Canada in 1849, and was first returned to Parliament in 1861. He subsequently sat in the provincial legislature of Ontario; was provincial secretary 1867–71; commissioner of Crown lands 1871; and leader of the opposition 1872–76. He was appointed to the bench in 1878, and in 1884 became chief justice of the Court of Common Pleas of Ontario. He was knighted in 1887.

CAMERON, Richard, Scottish Covenanter: b. Falkland, Fifeshire, 1648; d. Ayrsmoss, 22 July 1680. He was at first a schoolmaster, and for a time was tutor in the family of Sir Walter Scott of Harden. Being converted by the field-preachers, he became an enthusiastic votary of the Covenant. On 20 June 1680, in company with about 20 other persons, well armed, he entered the village of Sanquhar, and proclaimed at the cross that he and those who adhered to him renounced their allegiance to the King on account of his having abused his government, and also declared a war against him and all who adhered to him, at the same time avowing their resolution to resist the succession of his brother, the Duke of York. The privy council immediately put a reward of 5,000 merks upon Cameron's head, and 3,000 upon those of Cargill and Douglas, his associates, and parties were sent out to waylay them. The little band kept together in arms for a month in the mountainous country between Nithsdale and Ayrshire. But on 22 July, when they were lying in Ayrsmoss, near Auchinleck in Ayrshire, Bruce of Earlshall approached them with a party of horse and foot much superior in numbers. A brief skirmish took place, in which the insurgents were allowed even by their enemies to have behaved with great bravery; but nothing could avail against superior numbers. Cameron being among the slain, his head and hands were cut off and carried to Edinburgh, along with the prisoners. Consult Herkless, 'Richard Cameron' (in 'Famous Scots Series,' New York 1896). See Cameronians; Cameronian Regiment.

CAMERON, Simon, American statesman: b. Donegal, Lancaster County, Pa., 8 March 1799; d. there, 26 June 1889. He learned printing and in 1820 he was editor of a paper in Doylestown, Pa., and in 1822 held a similar post in Harrisburg. He then interested himself in banking and the building of railroads, and for a time served as adjutant-general of Pennsylvania. In 1838 he was commissioner to settle accounts with the Winnebago Indians and was accused of swindling them. From 1845 to 1849 he was United States senator from Pennsylvania, elected by the Democratic party. He became a member of the Republican party on its formation, and in 1856 was again elected United States senator. He was unsuccessfully supported for the offices of both President and Vice-President in the National Convention of 1860, and in 1861 was appointed Secretary of War by President Lincoln. He advocated the arming of fugitive slaves and other extreme measures. In January 1862 he resigned from the Cabinet, and was appointed Minister to Russia. He succeeded in gaining the support of the Russian government for the Union. In November of the same year he resigned, and lived in retirement till 1866, when he was again elected to the United States Senate. In 1872 he became chairman of the Committee on Foreign Affairs. In 1877 he retired from the Senate in favor of his son, James Donald Cameron. His influence over the Republican party was strong, and his power in the politics of his State practically absolute. The control was transferred later to M. S. Quay and Boies Penrose. Cameron was the first powerful State «boss» in American politics. His ideals may be gathered from his definition of an honest politician as «one who will stay bought when he is bought.» He was a vigorous opponent of civil service reform during the administration of President Hayes. Consult McClure, 'Old Time Notes of Pennsylvania' (2 vols., Philadelphia 1905).

CAMERON, Verney Lovett, English traveler in Africa: b. Weymouth, 1 July 1844; d. Leighton Buzzard, 26 March 1894. He entered the British navy in 1857, and in 1872 was chosen by the Royal Geographical Society of London to conduct an expedition for the relief of Dr. Livingstone. He was only in time to meet the remains of Livingstone at Unyanyembe, but pushed onward to Ujiji on Lake Tanganyika, and partly circumnavigated this great sheet of water, establishing the fact that its outlet was the Lukuga. Not being able to follow the Lualaba River downward, he continued his journey westward to Benguela, and was thus the first to cross tropical Africa from east to west. Returning to England in 1876, he was raised to the rank of a commander. In 1878 he made a journey through Asia Minor and Persia in order to satisfy himself as to the feasibility of a railroad connecting India with the Mediterranean, and in 1882 with Sir Richard Burton explored the country behind the Gold Coast. He published accounts of his journeys in his 'Across Africa' (1877); 'Our Future Highway to India' (1880); and 'To the Gold Coast for Gold' (with Sir R. F. Burton, 1883). He died from an accident in the hunting field.

CAMERON, Mo., city of Clinton County on the Chicago, Rock Island & Pacific and the Chicago, Burlington & Quincy railroads, 50 miles northeast of Kansas City. The dairying industry is important, gloves are manufactured, municipal waterworks and electric lighting plants are operated and Missouri Wesleyan College is situated here. Pop. 2,980.

CAMERON, Texas, city, county-seat of Milan County, on the Gulf, Colorado & Santa Fé and the San Antonio & Aransas Pass railroads, 53 miles south of Waco. Stock raising and cotton growing are the chief industries and coal and timber are exploited from neighboring deposits. Cameron was founded in 1875. Pop. 3,263.

CAMERON HIGHLANDERS, the old 79th Regiment in the British army, raised in 1793 by Allan Cameron of Erroch. It wears the Highland dress and forms the first battalion of the King's Own Cameron Highlanders. Its depot is at Inverness and its record office is maintained at Perth. A second battalion is now linked with the regiment, the first being known as the 79th Foot.

CAMERONIAN REGIMENT, a British regiment raised in 1689 among the Cameronians of the west of Scotland to support William III, and long famous as the 26th Regiment. It forms now the first battalion of the Cameronians, Scottish rifles (Regimental District No. 26; Depot and Record Office Hamilton, N. B.), the second battalion being the old 90th Regiment. It takes its name from William Cameron, and its origin goes back to the time when the Covenanters went armed to public meetings.

CAMERONIANS, a sect of Scotch Presbyterian dissenters, named after Richard Cameron. James I had enforced on his Scottish subjects a liturgy which the people abhorred, and this led, in 1638, to the formation of the covenant, «in behalf of the true religion and the freedom of the kingdom.» The organization of the Scottish presbytery was still further completed in the adoption of the Presbyterian form of Church government, a Calvinistic confession of faith, and the two catechisms, which documents are the standards of the Scottish kirk to this day. Throughout the revolution of 1688 the Cameronians maintained inflexible hostility to the royal usurpation of religious freedom. They supported the Prince of Orange on his assuming the Crown of England, but were displeased and disappointed by the form in which the Presbyterian Church was restored. In 1709 they exerted all their influence against the union of Scotland and England. The presbytery of this denomination was not organized until 1 Aug. 1743, when an act of toleration was procured in their favor. They still have a distinctive existence in Great Britain and America, under the name of Reformed Presbyterians.

CAMEROONS, kä-mē-roon′, or **KAMERUN,** a German colonial possession in West Africa having originally an area of 191,130 square miles, which was increased in 1911 to 295,000 square miles by France agreeing to cede Kongo territory as compensation for loss of German influence in Morocco. It is bounded by Lake Chad on the north, French Kongo on the east and south, Spanish Guinea on the southwest and the Bight of Biafra and Nigeria on the west. From the sea to Lake Chad it measures over 700 miles, and its greatest breadth from east to west is 600. The territory receives its name from the Cameroon River, which enters the Bight of Biafra by an estuary nearly 20 miles wide. The swamps along the banks of the river render this district unhealthy for Europeans. Northwest of the river lies the volcanic group called the Cameroon Mountains, which rise to a height of 13,760 feet. The lower slopes of these mountains are more healthy and are covered with ebony, redwood and palm-trees. More important than the Cameroon River is the much longer Mbam, entering the Bight of Biafra a little south of the former, and navigable for 40 miles inland to Idia. Among cultivated plants are the banana, oil-palm, cocoanut, groundnut, manioc, yam, sweet-potato and colocasia; of more recent introduction are cacao, coffee, tobacco, etc. Among the minerals are gold and iron. There is a considerable trade in cotton, ivory and oil. The inhabitants are almost entirely of the Bantu stock, widely diffused throughout the more southerly portion of the continent, and many of them have almost regular European features. The coast of the Cameroon territory was annexed by Germany in 1884, and the interior was afterward acquired, the whole having been a German colony under a governor. The seat of government was at Buea, situated 3,000 feet above sea-level near the coast. At Duala there was a commodious floating dock; 150 miles of railroad had been constructed and there was wireless communication with Berlin through Togoland. The colony had never raised sufficient revenue to meet its expenditure, the last figures of which were £882,500, with receipts £361,500, imports £1,712,000 and exports £1,165,000.

In August 1914 operations were begun by the British against the Cameroons, which culminated in January 1916 when 14,000 native troops and 900 officers withdrew over the southwestern frontier into Spanish Guinea and there gave up their arms. A month later the northern garrison capitulated.

CAMILING, kä′mē-lïng, Philippines, town of Luzon, Tarlac province, on the Camiling River, 80 miles northwest of Manila. Fine timber, rice, corn and sugar are the chief products. The place has an unfortunate reputation as a hiding place for thieves and outlaws. Pop. 26,000.

CAMILLA, in Roman fable, a virgin, said to have been a daughter of Metabus, a Volscian king, and to have aided Turnus against Æneas (Virgil, 'Æneid,' vii). She was slain by Arruns, an Etruscan ally of Æneas (Virgil, 'Æneid,' xi, 648–833).

CAMILLE, ka-mēl′, the heroine of Dumas' novel, and the play adapted from it. (See LA DAME AUX CAMÉLIAS); also the heroine of Corneille's 'Les Horaces,' founded on the old Roman legend of the Curiatii.

CAMILLUS, Marcus Furius, Roman patrician: d. 365 B.C. He is famous as the deliverer of the city of Rome from the Gauls. He first came into notice as consular tribune in 403 B.C. His military successes were numerous, but the accounts of them have become mixed with considerable mythological fiction. In 396 B.C. he was made dictator during the Veientine War and captured the town of Veii after it had defied the Roman power for more than 10 years. In 394 B.C. Camillus besieged the Falerii, and by an act of generosity induced them to surrender. Three years later the envy and jealousy of enemies caused him to exile himself for a time, and he was living in retirement when the Gauls, under Brennus, invaded and captured Rome, with the exception of the capitol. Camillus was now appointed dictator a second time, and was successful in repelling the invaders, rebuilt Rome and gained new victories over the Volsci and others. In 386 he was elected dictator for the third time and refused the office. In 381 he carried the Roman arms to victory against Præneste and other Latin towns. For the fourth time he became dictator in 368, but abdicated in the same year. A new invasion of the Gauls called him, at the age of 80, once more to that position, and he defeated and dispersed the barbarians near the site of Alba Longa, and concluded a peace between patricians and plebeians and aided in passing the Licinian Laws. He erected a temple to Concordia near the Capitol, retired from public life and died of the plague about 365 B.C. universally respected and lamented. See ROME, HISTORY, and consult Plutarch, 'Camillus.'

CAMINATZIN, kä-mē-na-tsēn', or **CACUMAZIN**, Mexican king: d. 30 June 1520. He was nephew of King Montezuma and reigned over Tezcuco at the time of the Spanish conquest. Caminatzin, with more courage and enterprise than his uncle, proposed to his subjects a declaration of war against the foreigners. The proposal was received with enthusiasm, and Caminatzin called upon the Spaniards to leave the country immediately or to expect to be treated as enemies. Montezuma invited his nephew to Mexico to become reconciled with the Spaniards. The answer of Caminatzin was that he could enter Mexico only to destroy the tyrants of his country. Montezuma then despatched secret agents to Tezcuco to get possession of the young prince by whatever means. His first officers and nearest friends were corrupt, and he was delivered by them to Cortés and imprisoned. He perished during the evacuation of Mexico by the Spaniards.

CAMISARDS, kăm'ĭ-zärdz, Protestants in France (in the Cévennes), who, in the beginning of the 18th century, in consequence of the persecution to which they were exposed after the revocation of the Edict of Nantes in 1685, rose against the royal deputies. The name is usually thought to be derived from «camise,» a provincial form of the French word «chemise,» signifying a shirt or smock, and it is said to have been applied to them because their ordinary outer garment was a smock or blouse. The first occasion on which they broke out into open revolt against the royal deputies was on the night of 24 July 1702, when 50 of them attacked the house of the Abbé du Chayla, one who had signalized himself by his cruelty during the persecutions. They set free the prisoners whom they found confined in the dungeons, and put the abbé himself to death. This was the signal for a general rising of the mountaineers. The government sent troops to punish the authors of these acts. A certain Jean Cavalier, a peasant, whom a fortune-teller had pointed out as the deliverer of Israel, placed himself at the head of the Camisards. His unlimited authority with his adherents, his talents and courage, enabled him to oppose the measures of experienced generals with so much success that negotiation was substituted for force. The Marshal Villars in 1704 made a treaty with Cavalier, by virtue of which Cavalier himself was received into the royal service as a colonel. This treaty, however, did not satisfy his associates, because it did not concede to them liberty of conscience, and on that account Cavalier was reproached as a traitor who had sacrificed the cause of his coreligionists to his own interest. At the court, too, he was received with coldness, so that in a short time he was glad to go into voluntary exile. He went to England, where Queen Anne gave him a favorable reception. Voltaire, who became acquainted with him in London, speaks of him in high terms. At the time of his death Cavalier was general and governor of Jersey. The name *camisards blancs* (white camisards), or *cadets de la croix* (cadets of the cross), was given to a band of Roman Catholics formed to put down the Calvinistic Camisards, who were called *camisards noirs*, or black Camisards. See also FRANCE — HISTORY.

CAMLET, or **CAMBLET** (in French, *camelot*), a name applied in England to a fabric made of long wool, hand-spun, sometimes mixed with cotton or linen yarn. Various derivations of the word are given. Some consider it to be of the same root with camel, because it was originally made of camel's hair; others derive it from the Arabic *chamal*, signifying fine, because according to them it was originally made of the fine hair of the Angora goat.

CAMMAERTS, căm-märts', **Emile**, Belgian poet and journalist. He gained a worldwide celebrity by his fierce poetical denunciations of the German invasion of Belgium in 1914. But though his muse at times rises to impassioned heights, it is rather as the poet of domestic joys and sorrows that he shines; it is through the tender details of his descriptions that he makes his best verses. With a number of exiled literary and artistic compatriots, Cammaerts issued in 1916 a work «in recognition of the help given by the British empire and the United States during the great War.» It bore the title of «A Book of Belgium's gratitude.» Consult 'New Belgian Poems: Les trois rois et autres poèmes' (New York 1916); 'Chants patriotiques et autres poèmes,' in French and English.

CAMMERHOFF, John Christophe Frederic, Moravian bishop in America: b. near Magdeburg, Germany, 28 July 1721; d. Bethlehem, Pa., 28 April 1751. He was educated at Jena, and at the age of 25 was consecrated a bishop in London and came to America as Bishop Spangenburg's assistant. He preached in Pennsylvania and New York, but his greatest successes were made among the Indians. The Iroquois adopted him into the Turtle tribe of the Oneida nation, and gave him the name of Gallichwio, or «A Good Message.» In 1750 he undertook amid great hardships a tour to Onondaga. It occupied three months, embraced a distance of 1,600 miles and was filled with hair-breadth escapes. He was too weak to endure such enterprises, and died the following year. The Iroquois mourned him as a brother and said of him «He was an honest, upright man, in whose heart no guile was found.» Thirty years later Zeisberger heard his name mentioned among them with deep respect and veneration. The memory of his devotion and irrepressible missionary zeal has ever been held in honor by the people of his faith.

CAMÕES, kä-môñ'ĕsh, or **CAMOENS, Luiz Vaz de**, Portuguese poet: b. Lisbon probably 1524, or 1525; d. there 1579. His father, Simon Vaz de Camões, was a ship-captain, who perished by shipwreck on the coast of Goa about 1552. Camões studied at Coimbra, of which his uncle, Dom Bento de Camões became chancellor in 1539, the year of Luis' entrance to the university. At that time writers were esteemed in proportion as they imitated the ancients. Camões was inspired by the history of his country, and by the manners of his age. His lyric poems, like the works of Dante, Petrarch, Ariosto and Tasso, belong to the literature formed under the influence of Christianity. After the completion of his studies he returned to Lisbon, where he fell deeply in love with a lady of the palace, Catharina d'Atayada. Violent passions are often joined with great talents — Camões had both. He was exiled to Santarem on account of disputes in which his love for Catharina involved him. From despair he became a soldier, and served in the fleet which the Portuguese sent against Morocco. He composed poetry in the midst of battles, and as danger kindled his genius, so genius animated his courage. An arrow deprived him of his right eye before Ceuta. He hoped that his wounds would receive a recompense, though his talents were not appreciated; but envy opposed his claims. Full of indignation at seeing himself neglected, he embarked in 1553 for India. His powerful imagination was excited by the heroic deeds of his countrymen in this quarter, and although he had much reason to complain of them, he could not resist the desire of celebrating their glory in an epic. But this vivacity of mind, essential to the poet, is not easily united with the moderation which a dependent condition demands. Camões was displeased with the abuses of the government in India, and wrote a satire, which caused his banishment to Macao. Soon after he was removed to the Moluccas, but after three years of captivity a new viceroy recalled the decree of banishment against him, and appointed him administrator of the effects of deceased persons at Macao. His chief poem, the 'Lusiad,' was composed partly during the period of his captivity, and partly while he held the office of administrator. Camões was at last recalled from his banishment. At the mouth of the river Mekon, in Cochin-China, he was shipwrecked, and saved himself by swimming — holding in one hand above the water the manuscript of his poem, the only treasure which he rescued from the waves. In Goa he encountered new persecutions; was confined in prison for alleged embezzlement of funds entrusted to him during his tenure of office at Macao, and not allowed, until his friends became responsible for him, to embark and return to Lisbon in 1569. King Sebastian, yet hardly past the age of childhood, took an interest in Camões. He accepted the dedication of his epic (which appeared in two editions, varying both in the text and the orthography, in 1572), and being on the point of embarking on his expedition against the Moors in Africa, felt more sensibly than others the genius of the poet, who, like him, loved dangers if they led to glory. But Sebastian was killed in a battle before Alcaçar in 1578, and with him the royal family became extinct, and Portugal lost her independence. Every source of assistance, as well as every hope of Camões, was destroyed by this event. So great was his poetry that at night a slave, whom he had brought with him from India, begged in the streets in order to support the life of his master. In this misery he yet wrote lyric poems, some of which contain the most moving complaints. This hero of Portuguese literature, the ornament of his country and Europe, died in a hospital, neglected. In 1596 a splendid monument was erected to his memory. Vasco da Gama's expedition to India is the subject of his great poem. The parts of it which are best known are the episode of Ines de Castro, and the appearance of Adamastor who, by means of his power over the storms, aims to stop Gama's voyage when he is about to double the Cape. In conformity to the taste of the time, Camões united in this poem a narrative of the Portuguese history with the splendor of poetic description, and Christianity with mythological fables. He pleased himself with tracing the descent of the Portuguese from the Romans, of whom Mars and Venus are considered the progenitors and protectors. Since fable ascribes to Bacchus the first conquest of India, it was natural to represent him as jealous of the undertaking of the Portuguese. If the imitation of the works of classical antiquity has been of any disadvantage to the 'Lusiad,' the injury consists, perhaps, in a diminution of the originality which one expects in a work in which India and Africa are described by an eye-witness. The general interest of the poem consists principally in the patriotic feeling which pervades it. The national glory of the Portuguese appears here in every form which invention can lend to it, and therefore the countrymen of Camões must naturally admire this poem more than foreigners. Some critics pronounce the 'Lusiad' a more powerful and pure historical painting than Tasso's 'Jerusalem Delivered.' A valuable edition of the 'Lusiad' (Os Lusiadas, etc.) was published by Joze Maria de Souza-Botelho (Paris 1817). It has been translated into English by Fanshaw, Mickle and Duff; by J. J. Aubertin (with Portuguese text), and by Sir R. F. Burton (with 'Life of Camões, Commentary,' etc.; 6 vols., London 1881). The works of Camões, besides the 'Lusiad,' consist of sonnets, songs, odes, elegies, eclogues, *redondillas*, epigrams, satires, letters and three dramas, 'Amphitryon,' after Plautus, 'King Seleucus' and the 'Love of Philodemus.' The most complete edition of Camões' works is that of the Visconde de Juromenha (6 vols., Lisbon 1860–69); also the small handy edition of Theophile Braga (3 vols., Oporto 1874) and the edition by Carl von Reinhardstoettner (Strassburg 1874). Consult also Viscount Strangford, 'Poems from the Portuguese of Luis de Camoens, with Remarks on his Life and Writings, Notes, etc.' (6th ed., London 1810); and Branco, Camillo Castello, 'Manual bibliographico portuguez' (Oporto 1878); Da Silva, I. F., 'Diccionario bibliographico portuguez' (Vol. V, Lisbon 1860), and also Vols. XIV and XV (Vols. VII and VIII of the continuation of Brito Aranha; Lisbon 1886–88). These volumes are devoted exclusively to Camões and his works, and are profusely illustrated. Consult Adamson, 'Memoirs of the Life and Writings of Luis De Camões' (London 1820); Braga, 'Historia de Camões' (3 vols., Oporto 1873–75); Castello-Branco, 'Luis de Camões' (Oporto 1880); Storck, 'Luis de Camõens Leben' (Paderborn 1890), the best biography of Camões so far published. See LUSIAD, THE.

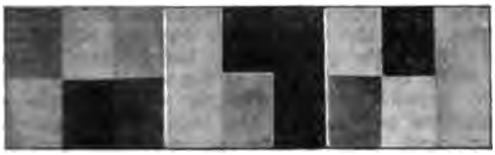
CAMOMILE. See CHAMOMILE.

CAMONICA, kä-mō-nē'ka, or **VALLE CAMONICA**, a valley in North Italy, in the province of Brescia, formed by two branches of the Rhætian Alps, watered by the Oglio, and stretching about 50 miles from north-northeast to south-southwest as far as Lake Iseo. It is a principal thoroughfare between Italy and the Tyrol. It has quarries for iron, copper, lead, marble and slate. Its soil is fertile, agriculture being one of the leading occupations; maize, grapevines and mulberry trees are extensively cultivated.

CAMORRA, an association in Naples, the members of which (Camorristi) carried on extortion as a regular business and were found at markets, fairs and all public gatherings in the exercise of their employment. The band became known in 1820, when it was not political but social, originating in the Neapolitan prisons, then filled with victims of Bourbon misrule. It was carried into the city in 1830 and became a political body of great influence in 1848. A determined effort was made to exterminate it in 1877, but in spite of the lessening of their power it has still remained vigorous. In 1900, a government inquiry was made in the course of a libel suit, the result of which was the formation of the Honest Government League and the consequent defeat of the Camorra in the municipal elections of 1901.

They were divided into several classes,— those who dressed as gentlemen and mingled with people of rank; those who practised their work on tradesmen and the like; and the political and murdering camorristi. There were various ranks and grades which might be attained in the Society, and certain ceremonies of a very severe character were celebrated. The Association extended its ramifications over entire Naples. It had central stations in all of the large provincial towns and 12 in the city of Naples. Consult Monnier, ‹La Camorra› (Florence 1863); Alongi, ‹La Camorra› (1890); Heckethorn, ‹Secret Societies of All Ages› (London 1897).

CAMOUFLAGE, că' moo-fläzh. This art is in reality an adaptation of the science of color to meet man's requirements according to the plan of nature's protective coloring but the idea may be greatly extended in scope as will be briefly suggested in the following paragraphs. It is well known that many species of birds, fishes and animals assume colorings and patterns which quite effectively conceal them in their natural environments. Some of these change their colorings and patterns from season to season and the chameleon and certain fishes have the ability to alter their color very quickly to an approximation of that of their immediate surroundings. Some fishes are also able very quickly to imitate approximately the pattern of the background upon which they are placed. The effectiveness of this scheme of protective coloring has indicated to man the possibility of providing protective concealment for men, batteries, etc., in warfare and in other activities and the science of color has revealed other possibilities. In utilizing this art in warfare the aim is to provide a covering which closely imitates that of the surroundings. In order to provide effective concealment it is necessary to consider the character of the lighting and herein the greatest obstacles are usually encountered because of its changeableness. The scheme will be introduced by means of a few examples. It is easy to mask a battery in the summer time amid green foliage by using a screen of green branches, grass, etc. The duck-hunter utilizes a suit of grass or a blind of vegetation in the same manner. In other seasons suitable changes in the screens may be made. If soldiers are to be concealed in a snow-covered winter landscape which is devoid of vegetation this may be accomplished by means of white clothing and even white masks or paint on their faces. On an overcast day the concealment may be accomplished quite effectively but on clear sunlit days the shadows cast upon the surface of the snow and the shadows on the various contours of the form usually render complete deception impossible especially if the soldiers are moving. If the winter landscape is not wholly barren of trees or shrubs and the soldier is on stationary outpost duty, a dark gray cloak is effective. In the case of vessels it has been found that a mottled pattern of grays has been quite effective toward rendering them less conspicuous or practically invisible. If the vessels lie low in the water it is obvious that the deception is generally more successful. However, the appearance of the surface of the water varies with the lighting and with the character of the sky and of the waves. It is obvious that the surface of the water assumes many appearances with a given lighting and sky condition, including the calm smooth surface, the choppy sea and the long swells or rolling sea. To a distant observer these differ least in appearance on a uniformly overcast day. On a sunlit day there are usually bright high-lights on the waves which are reflected images of the sun. Furthermore the surface color of the water is largely due to reflected images of the sky and clouds. The color of a smooth surface of the water at some distance from a given observer appears to him quite similar to that of the lower portion of the sky in the direction in which he is gazing. This is readily seen if a diagram is made and the optical law of reflection — the angle of incidence is equal to the angle of reflection — is applied. When small waves are running, beautiful color-effects are seen if the color of the zenith or upper portions of the sky differs materially from that of the lower sky near the horizon, as is usually the case after sunset. Such a surface of water appears to be a series of stripes alternating in color. From the simple diagram previously suggested it will be seen that the lagging side of a wave is reflecting toward the observer an image of a patch of sky near the horizon and the advancing side is reflecting an image of a patch somewhat nearer the zenith. If these patches are different in color, the beautiful effects already mentioned are accounted for. These different appearances of the water have been discussed in order to show that the best protective coloring for vessels differs according to lighting, sky condition, and surface character of the water. In other words, if practicable, several removable coatings, differing in pattern, could be provided. In general the most suitable color is bluish gray but there is always the difficulty with glint or high-lights, even if smoke can be suppressed or avoided. It is a comparatively simple problem to provide a coating for rendering a low-lying ship inconspicuous or even invisible under specific conditions of lighting, sky and surface of the water; however, in practice a compromise must be made in order that one coating will serve well under all conditions. In marine camouflage the outline of the vessel is important for it is usually seen against the sky by the submarine or distant enemy. The science of color can be used effectively in revealing guns, soldiers, etc., belonging to the enemy if they have not been provided with coverings closely resembling their environments. The plan is quite the reverse of camouflage in that it aims to augment the contrast in hue or in brightness. In general, all objects are "colored"; that is, relatively few objects are without hue. The latter are the whites, blacks and intermediate grays. We see an object only when there is a contrast between it and its background or immediate surroundings. This contrast may be in hue or in brightness but usually it is a mixture of both. Camouflage aims to eliminate these contrasts. It is a fact of color-science that a colored object — for example, a pigment — will not appear, in general, the same under two different illuminants. Both the hue and value or reflection factor of a colored object change with the illuminants. For example, in Fig. 1 are shown the relative values or brightness-contrasts of six colored fabrics under red, green and blue lights, respectively, as indicated. For example, the lower middle one, which was a blue fabric, is very dark under red light and is very bright under blue light. This experiment is significant in indicating the possibilities of using various colored screens before the eyepieces of field glasses and telescopes. A study of a landscape by means of such filters may reveal objects owing to the augmented contrast which would not be otherwise sufficiently conspicuous. Experiments made by the author before the beginning of the European War indicated such possibilities. For example, a khaki cloth amid green foliage may be made to appear darker or brighter than the surrounding green foliage by viewing it through blue-green and yellow-orange filters respectively. Actual measurements of the ratio of the brightness of the khaki cloth to that of a green leaf were respectively 0.7 through a blue-green filter, and 1.5 through a yellow-orange filter. These ratios are on the basis that, under daylight illumination, the two objects appeared of the same brightness when viewed without colored filters. The applications of colored screens to field glasses appears to be well worth while for many purposes outside of warfare. In order to meet all the conditions to be found, a series of filters, say blue, green, yellow, orange and red, could be provided in pairs for field glasses and arranged in a convenient manner for quickly changing from one set to another. These screens should be as pure in color as practicable. Another promising filter is a yellow or canary screen whose object would be to eliminate the bluish haze which is usually present in distant landscapes. A large percentage of light is sacrificed with such screens but fortunately the intensity of daylight is usually far greater than is necessary. It is doubtful that artificial light will play an appreciable part in the art of camouflage in warfare; however, it has possibilities in other fields in certain developments in color-effects applicable to the stage, etc. Applying the principle already discussed briefly in connection with Fig. 1 it is possible to relate various colors with certain patterns in such a manner that certain parts of the scene will disappear completely under a given illuminant. For example, a gray on a red background is readily distinguished under ordinary light because of the difference in brightness and in hue. Under a red light there will be no difference in hue if the red background has been properly selected in relation to the illuminant. There remains, then, only the possibility of a contrast in brightness which depends upon the relative amounts of light reflected by the gray and red objects. If the gray is properly selected it will appear of the same brightness as the red background under the red light and therefore will be indistinguishable or invisible. By the use of the same principles applied to a number of pigments (those having the quality of high transparency being more satisfactory), striking disappearing effects can be obtained by varying the color of the illuminant. The effect which is possible by applying these principles is illustrated in Fig. 2 although rather feebly, owing to the absence of color. The paints which were made of high transparency and purity were so chosen that under ordinary illumination the scene appeared as in the illustration at the left. Under an orange-red light the mountain and entire background disappeared with the result that the scene appeared as in the right-hand illustration.



(Red Light) (Green Light) (Blue Light)

FIG. 1 — Illustrating the effect of colored lights upon the appearance of six colored fabrics

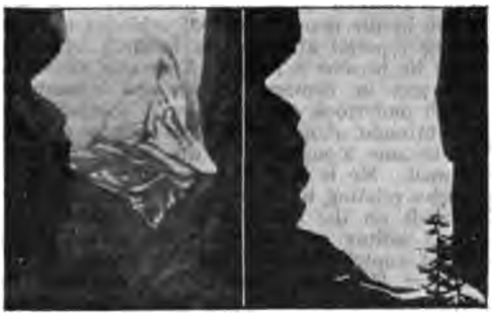


FIG. 2—Illustrating changing of scenery by the use of colored lights or Camouflage applied to canvass

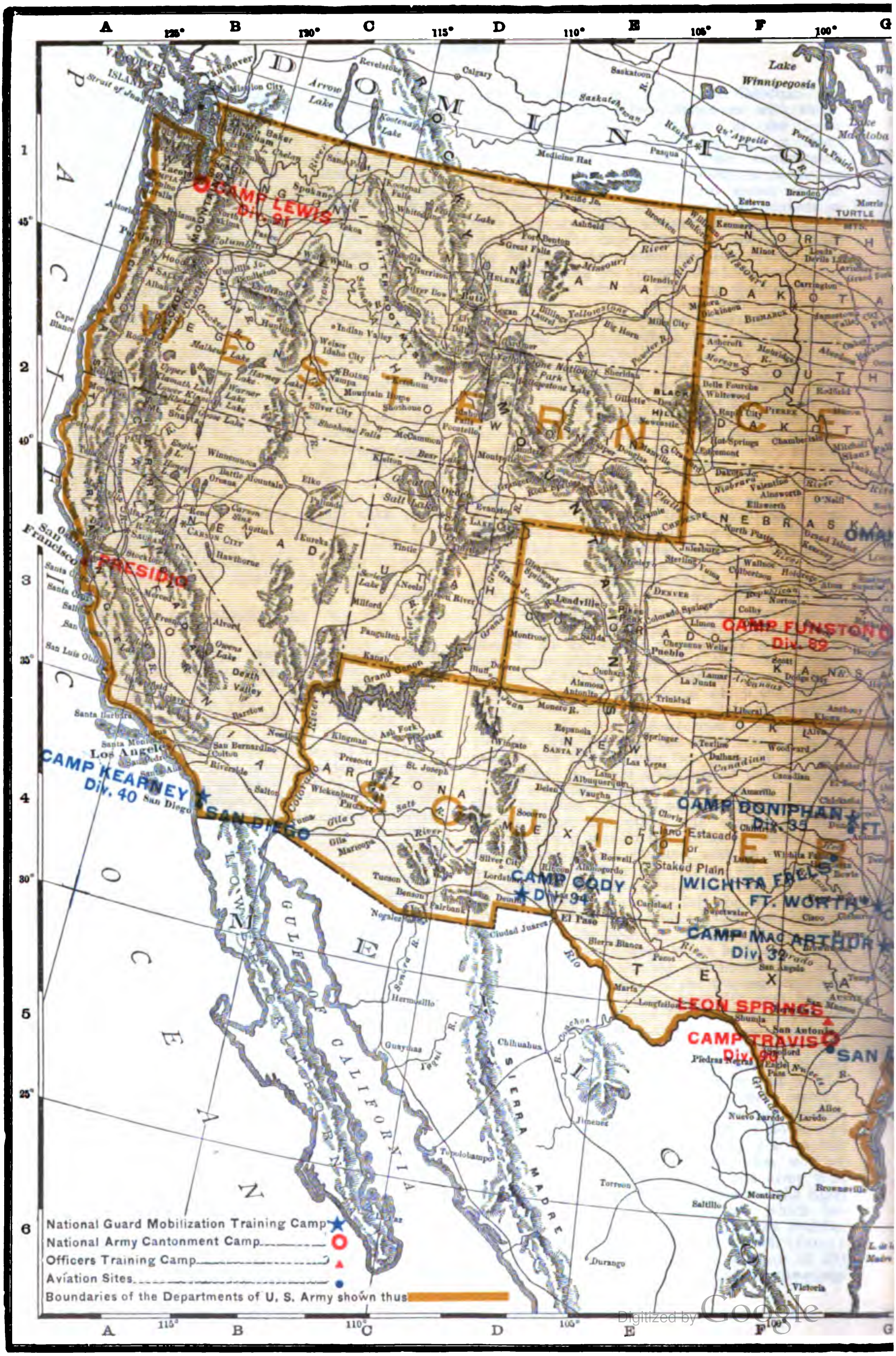
This example indicates what could be accomplished outdoors if both the landscape and lighting could be controlled. Many effects have been produced on canvas, such as changing a summer landscape to a winter scene, causing figures to disappear, etc. The scheme has possibilities on the stage, in displays and in advertising. Ordinary pigments are not as satisfactory as water colors or paints made by coloring a white base with aniline dyes. In applying the art of camouflage it is seen that the science of light and color contains the underlying principles. With a thorough acquaintance with these much can be accomplished. Even some of the efforts of the enemy to conceal soldiers, batteries, etc., could be rendered ineffective by utilizing colored screens on telescopes and field glasses unless the colors were very carefully chosen by the enemy. For example, for perfect concealment the object must possess the same color as its surroundings, not only as viewed by the eye but as analyzed by the spectroscope. This point is too intricate to discuss in detail but in color-work it is always well to remember that in respect to color the eye is synthetical and not analytical. In other words, the eye records only the integral effect of the spectral colors of which ordinary colors consist. For example, two yellows may appear the same to the eye under a given illuminant though they may be quite unlike in spectral composition. If the latter is true, the two yellows will not in general appear alike under any other illuminant. Camouflage has been practised in all wars, but in the European War it has been highly developed. Consult Luckiesh, M., 'Color and Its Applications.'

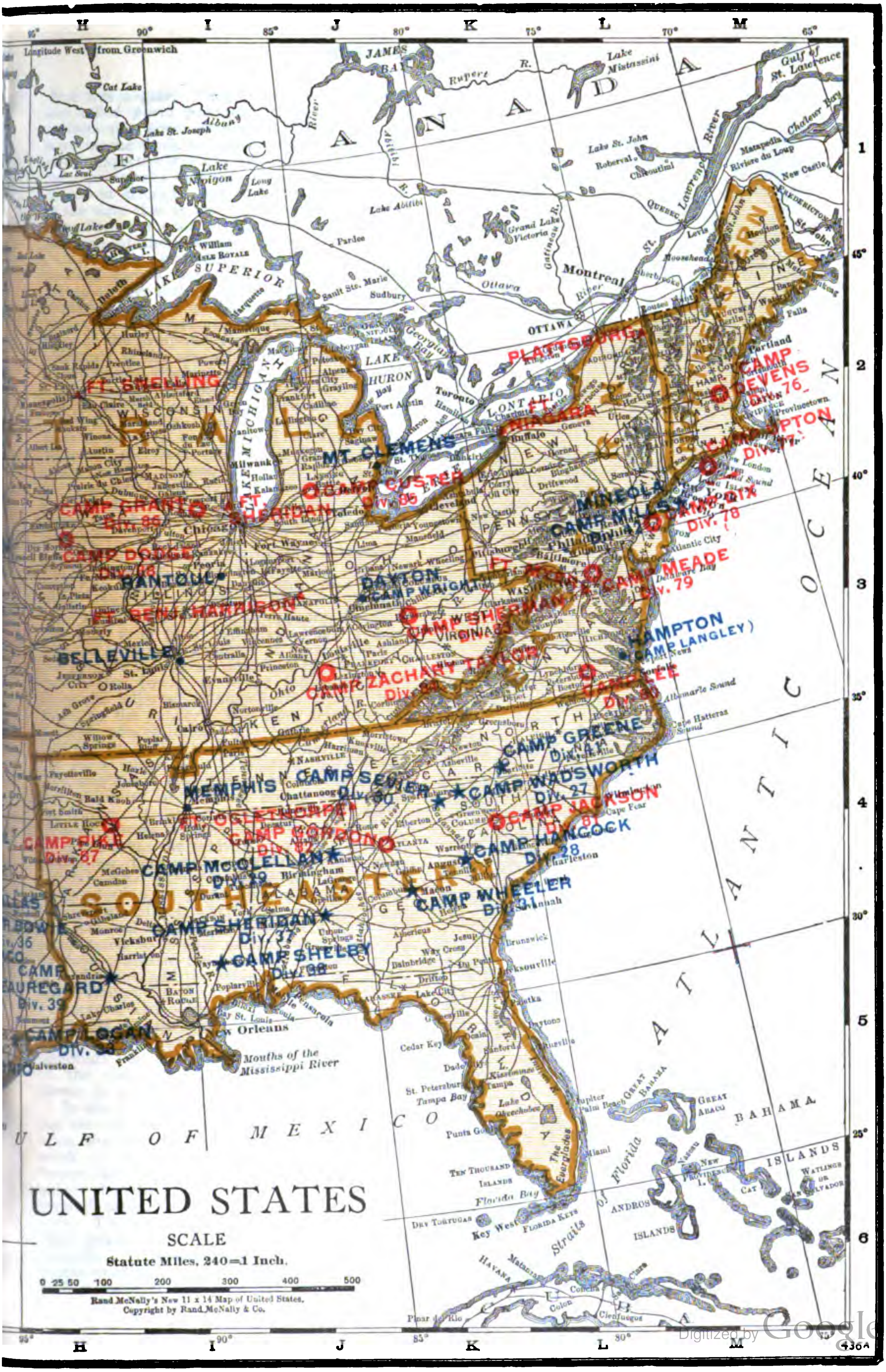
M. LUCKIESH.

CAMP, käń, Maxime du. See DU CAMP, MAXIME.

CAMP, Walter, American manufacturer and writer: b. New Britain, Conn., 7 April 1859. He was educated at the Hopkins Grammar School and at Yale University, from which he was graduated in 1880 with the degree of A.B. For over 30 years he has been associated with the New Haven Clock Company, of which concern he is now president. He was active in the management of athletics at Yale, giving especial attention to football. On this sport he became a leading American authority, and was in demand on various committees which undertook the revision of football rules and brought about the present system of play. He became a member of the Yale University Council. He is a prolific writer on sports, of articles relating to the effect of sport and playgrounds on the development of character; is sports editor of various periodicals; also a liberal contributor on sporting topics to *The Century, Harpers', Collier's, Saint Nicholas,* and numerous other American and English magazines. He is editor of *The Boys' Magazine;* editor-in-chief of 'The Young People's Library.' He is author of 'The Substitute' (1908); 'Jack Hall of Yale' (1909); 'Old Ryerson' (1911); 'Danny Fists' (1913); 'Captain Danny'; 'Danny the Freshman'; 'Bridge Don'ts'; 'Auction Bridge Don'ts'; 'Auction Bridge up to Date'; 'Book of College Sports'; 'American Football'; 'Football Facts and Figures' (1886); 'Football'; 'Yale, Her Campus, Class-Room and Athletics'; 'Drives and Puts,' with Lillian Brooks (1899).

CAMP, in military use, the place and aggregate body of tents or huts for soldiers in the field. In modern times a difference is often made between camp, bivouac and cantonment, the first signifying the quarters of an army sheltered in tents; the bivouac the situation of one which dispenses with them, and remains either entirely in the open air, or, when time allows it, in huts built of branches, etc.; the cantonment when the troops occupy buildings in towns or villages. Camps, in a general sense, are of very ancient origin, since almost all nations in their infancy lived as nomads, dwelling in tents, as is the case with many tribes in Asia and Africa at the present day, for example, the Arabs. Among the Greeks, the Lacedæmonians seem to have been the first who devoted attention to the art of forming military camps. The form which they adopted was the circular, that being the form which was best calculated to enable the general, who had his tent in the centre, to have a view of the whole camp, and to dispatch assistance in the shortest possible time to any part of the camp that might be attacked. The Romans probably first carried the art of encampment to a high degree of perfection, on account of their many wars in distant and thinly settled regions, where their large armies found no cities to quarter in. Cæsar and several other Roman authors give us much information on their way of constructing a camp, and in Polybius we have a detailed description of the consular camp as it was made in his time. This form of camp, with some modifications, continued to be the usual one during the whole period of the Roman domination, and down to the time of the invention of gunpowder. The site was chosen by the general himself, or by one of the military tribunes; a spot from which a view of the whole camp could be obtained. This spot was marked by a white pole as the point from which the rest of the camp was measured out, and the place where the general's tent (*prætorium*) was to be erected. The form of the camp was a square, and it was divided into two parts by a street from 50 to 100 feet wide, called the *principia* or *via principalis,* which ran across it. One of these divisions occupied about one-third of the whole space, the other, the remaining two-thirds; and it was in the former of these that the *prætorium* was situated, with an open area around it extending 100 feet on all sides. On the right of the *prætorium* was the *forum* or market-place, and on the left the *quæstorium,* where were the camp-stores under the superintendence of the *quæstor.* Beyond these again on each side there were select bodies of horse and foot taken from the extraordinaries, and behind this whole line of the encampment, and separated from it by a street 100 feet broad, was the place reserved for the main body of the extraordinaries, and for foreigners and occasional auxiliary troops. Immediately in front of the line of the encampment first described the tents of the military tribunes and of the *præfecti,* or officers of the allies, were erected, the former before the *forum* and *quæstorium,* the latter before the select bodies of horse and foot. These tents lined the *principia* on the side of the *prætorium.* On the other side of the *principia* the main body of the army was quartered, the allies being stationed on the right and left, the two Roman legions which belonged to every consular army in the middle. The whole was surrounded with a ditch (*fossa*) and a rampart (*vallum*) at the distance of 200 feet from the tents. On every side of the camp


WESTERN
SOUTHERN
CAMP LEWIS
Div. 91
PRESIDIO
CAMP KEARNEY
Div. 40
SAN DIEGO
CAMP FUNSTON
Div. 89
CAMP DONIPHAN
Div. 35
CAMP CODY
Div. 34
WICHITA FALLS
FT. WORTH
CAMP MAC ARTHUR
Div. 32
LEON SPRINGS
CAMP TRAVIS
Div. 90
PACIFIC OCEAN
DOMINION
LOWER CALIFORNIA
GULF OF CALIFORNIA
MEXICO
SIERRA MADRE
WASHINGTON
OREGON
CALIFORNIA
NEVADA
IDAHO
MONTANA
WYOMING
UTAH
COLORADO
ARIZONA
NEW MEXICO
TEXAS
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
National Guard Mobilization Training Camp ★
National Army Cantonment Camp ○
Officers Training Camp ▲
Aviation Sites ●
Boundaries of the Departments of U. S. Army shown thus


UNITED STATES
SCALE
Statute Miles, 240=1 Inch.
0 25 50 100 200 300 400 500
Rand McNally's New 11 x 14 Map of United States.
Copyright by Rand McNally & Co.
Longitude West from Greenwich
H I J K L M
1 2 3 4 5 6
C A N A D A
ATLANTIC OCEAN
GULF OF MEXICO
NORTHEASTERN
NORTHERN
CENTRAL
EASTERN
SOUTHEASTERN
PLATTSBURG
CAMP DEVENS Div. 76
CAMP UPTON Div. 77
FT. NIAGARA
MT. CLEMENS
CAMP CUSTER Div. 85
FT. SNELLING
CAMP GRANT Div. 86
FT. SHERIDAN
CAMP DODGE Div. 88
RANTOUL
MINEOLA
CAMP MILLS Div. 42
CAMP DIX Div. 78
FT. MEADE
CAMP MEADE Div. 79
DAYTON
CAMP WRIGHT
FT. BENJ. HARRISON
CAMP SHERMAN Div. 83
WEST VIRGINIA
HAMPTON (CAMP LANGLEY)
BELLEVILLE
CAMP ZACHARY TAYLOR Div. 84
CAMP LEE Div. 80
CAMP GREENE Div. 41
CAMP SEVIER Div. 30
CAMP WADSWORTH Div. 27
MEMPHIS
FT. OGLETHORPE
CAMP JACKSON Div. 81
CAMP GORDON Div. 82
CAMP HANCOCK Div. 28
CAMP PIKE Div. 87
CAMP McCLELLAN Div. 29
CAMP WHEELER Div. 31
CAMP SHERIDAN Div. 37
CAMP SHELBY Div. 38
CAMP BEAUREGARD Div. 39
CAMP LOGAN Div. 33
CAMP BOWIE Div. 36

there was a gate. That behind the *prætorium* was called *porta prætoria,* the one on the opposite side *porta decumana.* The other two were at the ends of the *principia,* and were called respectively *porta principalis dextra* and *porta principalis sinistra.* The camp was improved in strength and convenience according to the time that it was occupied, and in some cases, from the want of fortresses, it was made the basis of their military operations.

After the invention of gunpowder, entrenched camps, such as that just described, proved of very little service, as they afforded no protection against projectiles shot from long ranges, and it became necessary to keep the mass of the army not actually engaged at such a distance in the rear of the fighting line as to be beyond the reach of the most powerful guns of the enemy. In the European War ranges as high as 18 miles were attained, and in a few instances 20 miles was recorded for a few shots from each new gun. The camp, in the old sense, therefore, has lost its former significance, and has become little more than a depot of temporary lodgment of reserves, the fighting line and its immediate supports being protected underground in dugouts and bombproof constructions.

With the advent of the fighting aeroplane a new danger has to be met. These machines may rise behind the enemy lines to a height where they are no longer visible, and travel many miles to the rear of an opponent's fighting line and drop high explosives upon a camp which is safe from gunfire. In these conditions the camp must be so disguised by the art of camouflage (q.v.) as to be indistinguishable from the adjacent country when viewed from above by the aviator. The camp defenses then become reduced to two: (1) Against spies; and (2) against aircraft. For the latter, quick-firing guns which may be pointed upward at a high angle, are mounted on automobile trucks, and stationed at outlying points surrounding the camp. It has recently become common to form camps in time of peace for the sake of disciplining the soldiers to a camp life, and exercising them in the evolutions and manœuvres of actual warfare. These are called camps of instruction, of which examples are seen in the United States, where the organizations of the National Guard in the different States are accustomed to annual encampments for these purposes; also in the camp for British troops at Aldershot, and temporary camps throughout Great Britain for the training of the militia and volunteers, and in the like customs and establishments of other countries. Such camps are generally of a permanent type, with substantial buildings and arranged to provide many more of the comforts of life than is usual with camps in the field.

In the United States army the duty of selecting the site and laying out the camp devolves upon the engineer corps. This section of the work of the engineers is termed technically "castrametation." The practice followed requires that the site shall be on slightly sloping ground easily drained, and with a sunny exposure. The surface should be well covered with short grass, and the subsoil should be sandy or gravelly. For a summer camp a high and breezy spot is selected: for a winter camp a site with a southern exposure, and a windbreak of woods toward the north. The water supply should be pure, abundant and reasonably accessible. Good roads should approach the camp site from several directions. Fuel, forage, pasture and supplies should be available near by. The streets of the camp are ditched on both sides, and each tent is surrounded with a shallow trench. The streets are swept daily, and no refuse is permitted to lie between the tents. As a protection against epidemics, the camp is moved to a new site every two or three weeks. The United States soldier carries as a part of his pack a half of a "pup" tent, which buttoned to the half carried by another soldier forms a shelter for the two men. When set up it covers a ground area of six feet in length and four feet in width, and is three feet high at the peak. A regiment of 2,200 men requires an area of close to 30 acres, equivalent to a plot of ground about 1,100 feet square. For the permanent camp of instruction there is required also a considerable area for drills, parades and manœuvres. This need not be directly adjacent, but should be conveniently near. See ARMY ORGANIZATION. Consult Moss, J. A., 'Manual of Military Training' (Menasha, Wis., 1915); and 'Training Officers' Manual' (Menasha, Wis., 1911).

CAMP ALLEGHANY, W. Va., a Confederate camp where an engagement took place 13 Dec. 1861. After the affair at Camp Bartow, 3 Oct. 1861, the Union troops had remained at Cheat Mountain Summit. Gen. R. H. Milroy, who was in command 12 Dec. 1861, determined to attack Camp Alleghany, the summit of Alleghany Mountain, to which the Confederates had fallen back from Camp Bartow, and which was held by Col. Edward Johnson, with 1,400 men and eight guns, partially entrenched. With 1,800 men Milroy marched to Camp Bartow, 12 December, and made his dispositions. One column of 900 men, under Col. James A. Jones, was to ascend the mountain, until near its summit, when, leaving the road, it was to move to the left and attack Johnson's right and rear, while another column of 900 men, under Col. G. C. Moody, was to move down the Greenbank road and by a circuitous route, concealed by heavy forests, assail Johnson's left. The attacks were to be simultaneous at 4 A.M. of the 13th. Jones started at midnight, gained his assigned position on time, and waited for Moody, but his presence being discovered, he was quickly engaged and for a time met with success, driving the Confederates before him, but Johnson rallying his troops on that flank and fighting desperately, Jones was repulsed after a two-hours' contest, leaving his dead and many wounded on the field. While Jones was being driven from Johnson's right Moody was slowly approaching his left. He had been delayed by the difficulties of his route, and it was after 8 o'clock when he became engaged, and was met by such a severe fire of artillery and musketry that he could make no progress, but continued a desultory skirmish until afternoon, when he fell back, and the whole force, reuniting at Camp Bartow, marched back to Cheat Summit. The action was the most severely contested one of the West Virginia campaign of 1861. The Union loss was 20 killed, 107 wounded and 10 missing; the Confederate loss 20 killed, 98 wounded and

28 missing. Consult 'Official Records' (Vol. V).

CAMP BARTOW, or GREENBRIER RIVER, W. Va., a place where an engagement in the Civil War was fought, 3 Oct. 1861. On 2 October the Confederates held Camp Bartow, where the road from Beverly to Staunton crosses the Greenbrier River, with about 2,500 men and eight guns, under command of Gen. H. R. Jackson. Gen. J. J. Reynolds, commanding the Union troops at Cheat Mountain Summit, 12 miles west, concluded to feel Jackson's position and, if possible, force it. He marched at midnight of the second with about 5,000 men and 13 guns, drove in a picket post west of the Greenbrier on the morning of the third, and coming to within 600 or 700 yards of Jackson's entrenched position beyond the stream, opened on it with his artillery, the Confederates promptly replying. Several guns were disabled on either side, and Reynolds then, under cover of a demonstration on Jackson's left, moved with six regiments to turn his right. The regiment to make the demonstration on the left crossed the stream, but was quickly driven back, and when the six regiments were about to cross the stream on Jackson's right they were met by such a severe fire of artillery and musketry that Reynolds deemed further effort inadvisable and withdrew with a loss of 43 killed and wounded. The Confederate loss was 39 killed and wounded. Consult 'Official Records' (Vol. V).

CAMP DISEASES, disorders common to camp life and more or less incidental to the conditions of active military service, which are often such as to increase the virulence of ordinary diseases. They are generally of epidemic and infectious type, due in large measure to overcrowding and uncleanliness. The formerly dreaded scourge known as camp fever, or typhus, is now easily controlled by keeping the men free from the body lice which carry the disease from one man to another. Improper food, exposure to wet and to extremes of temperature, hard muscular labor, unhygienic surroundings and immoral or intemperate habits, contribute to the general conditions in which disease flourishes. Some of the troublesome infectious diseases of military life are: Asiatic cholera, bubonic plague, cerebrospinal meningitis, diarrhœa, dysentery, influenza, malaria, measles, mumps, typhoid fever and tuberculosis. Typhoid fever has been enormously decreased through inoculation with anti-typhoid serum. Alcoholism and venereal diseases depend on personal habits; bronchitis, frost-bite, pneumonia, rheumatism, snow-blindness and sunstroke come from exposure. Scurvy was formerly common, but it is now not often met with, owing to scientific feeding. From forced marches or severe exertion the modern soldier often suffers from heart-trouble, which often permanently incapacitates him for further service. However, the medical corps of modern armies are so efficient that the proportion of cases of sickness and of deaths resulting therefrom is less than in most well-organized communities at home, owing doubtless to the fact that in the army the orders of the medical staff are compulsory.

CAMP FIRE CLUB OF AMERICA, a social organization with headquarters in New York city, incorporated in 1904, devoted, in the interests of higher sport, to the protection of wild animals, birds and fish, and the preservation of forests. Formulated by the well-known naturalist, Dr. William T. Hornaday, its code of ethics forbids «the killing of all female hoofed animals, the sale of wild game for food, declares a good photograph of a large wild animal in its haunts entitled to greater credit than the dead trophy of the animal, and counsels the greatest conservatism in the killing of all kinds of game, and strict observance of all legislation calculated to protect and increase the supply of game.» Membership now numbering nearly 500 and including well-known American sportsmen, writers on outdoor life, painters and sculptors of animal and bird life, is limited to «those who have camped in the wilderness a total of 30 days or more, and who have successfully hunted and killed at least two specimens of big game.» The club has energetically initiated and supported legislative action in the interests of its purposes, notably the Hornaday clause in the 1913 tariff law «prohibiting the importation in the United States of wild birds' plumage for millinery purposes.»

CAMP FIRE GIRLS, an organization designed to assist in the development and dissemination of the home spirit, differing in this respect most strikingly from the organization called «Girl Scouts» which duplicates Baden Powell's original «Boy Scouts» of England, and so is primarily military and patriotic. The distinction becomes clearer if we recall the founder's words: «Here is an organization [Camp Fire Girls] that is back of the home. *It* is helping girls and mothers to discover that there are more interesting and happy things to do and relationships to enjoy in connection with everyday life than are to be found in the commercially supplied amusements.» Its president is Dr. Luther Halsey Gulick; the organization dates from 1911; the membership in 1916 was given as 73,000.

CAMP HOSPITALS. See HOSPITALS, MILITARY.

CAMP-MEETINGS, gatherings for religious purposes, held usually in thinly populated districts, and continued for several days at a time, with the view of securing prolonged and uninterrupted spiritual exercises. Assemblies of a like kind have been more or less usual at various periods in the history of the Christian Church; but it was in connection with Methodism in the United States that such meetings became especially prominent. The introduction of the protracted camp-meetings into England in 1799 by Lorenzo Dow led to the separation of the Primitive Methodists from the Wesleyans. See CHAUTAUQUA.

CAMP SCHOOLS, summer camps for girls and boys affording opportunities for physical training and educational advantages. In some of the camps, regular instruction is given in school subjects, mainly to assist students who have failed of promotion in school or who wish to prepare for entrance examinations. In other camps, there is no formal study of school subjects, but instruction is provided in nature study, camp craft, manual training, photography, music, besides the usual activities in land and water sports. In addition to this, the camps give valuable training in health habits, discipline and self-reliance. Some of these institutions are conducted by private individuals, and others by philanthropic associations. The beginning dates back to about 1885. Consult Findlay, J. J., 'Fielden Demonstration School Record' (Manchester, Eng. 1907); Robinson, E. M., 'Summer Camps' (in *Association Boys*, Vol. I, pp. 65–109); Sandys, E. W., 'Camps and Camping' (in *Outing*, Vol. 30, p. 373); Seton, E. T., 'The Birch-Bark Roll of the Woodcraft Indians'; Shield, G. O., 'Camping and Camp Outfits' (Chicago and New York); Talbot, W. T., 'Summer Camping for Boys' (*American Physical Education Review*, Vol. IV, pp. 30–33).

CAMPA. See ANTI.

CAMPAGNA, käm-pän'ya, **Girolamo** (called DE VERGNA), Italian sculptor: b. Verona 1552; d. about 1623. He was a pupil and assistant of Cataneo, many of whose works he completed. His earliest known work is a statue of the Doge Leonardo Lovedan in SS. Giovanni e Paolo, Venice. Among his own works are the bronze group for the high altar of San Giorgio; a Madonna and child in San Salvatore; the Saint Anthony in San Giacomo de Rialto, considered his masterpiece, and the altar in the Santi Giovanni e Paolo (all at Venice). Padua, Verona and Urbino also possess beautiful specimens of his art. His technical ability was of a high order and his treatment of decorative effects was highly successful. However, he was fettered by the mannerisms of his age.

CAMPAGNA DI ROMA, Italy, a territory which comprehends the greater part of Old Latium, from 30 to 40 miles wide and 100 long. By it is usually understood the desert plain which begins near Ronciglione or Viterbo, and including the Pontine Marshes, extends to Terracina. In the middle of this region lies Rome, on its seven hills, and on the Tiber. A sandy plain stretches along the Mediterranean. The ground is never more than 200 feet above sea-level and is entirely volcanic. The lakes of the Campagna are evidently craters of extinct volcanoes. Thus the Lake Regillus above Frascati lies at the bottom of an inverted cone of hard, black lava, rising in wild and naked masses from 40 to 60 feet high. The craters containing the lakes of Albano and Nemi have a very regular conical form. The Lake of Albano is also remarkable for its aqueduct, or *emissarium*, one of the most ancient and excellent works of the Romans, which discharges the waters of the lake through the mountains. It answers its original purpose even at the present day. There are, also, many sulphur springs here, particularly between Rome and Tivoli, where the water issues almost boiling from the earth, and forms the Lake of Solfatara, which contains floating islands, consisting of a calcareous deposit, that collects round substances thrown into the water. The vapors which rise from the ground all over the Campagna, and especially in the neighborhood of this lake, render the whole district unhealthy. The soil of the Campagna is in general dry, but very fertile in the lower parts. In the middle of the summer, when fevers render a residence in the Campagna very dangerous, all the inhabitants who can do so take refuge in the neighboring towns or in Rome itself; or they may retire with their cattle to the mountains. Besides huts, innumerable ruins of temples, circuses and monuments are scattered over the Campagna, particularly near the Via Appia; and long rows of aqueducts, some in ruins, some in a state of preservation, are overgrown with ivy and other plants. In the winter flocks of sheep pasture in these solitudes; during the summer they are driven up the Apennines. Herds of half-wild cattle remain during the whole year in the Campagna. The herdsmen are mounted, and armed with long lances, with which they manage the cattle very skilfully. Scarcely a ninth part of the Campagna is cultivated, the rest is used for pasturage. In the times of the ancient Romans, this dreary solitude exhibited a smiling picture of abundance and fertility. Yet even in those times the climate was far from being a healthy one. Strabo, Livy, Cicero, Horace and others agree in describing the districts in the neighborhood of Rome, Ardea and other towns which stood in what is now the Campagna di Roma, as extremely unwholesome, especially at certain seasons of the year; and it was only through the greatest exertions on the part of the ancient cultivators, and the numerous aids to cultivation that stood at their command, that this tract, now so desolate, was then made so productive. Several of the popes, particularly Pius VI, have attempted to lessen the insalubrity of the air by the draining of the Pontine Marshes which form the southern portion of the tract. In recent years the Italian government has taken up the problem, and has accomplished much in the way of reclamation by planting eucalyptus trees, and by drainage and other works, thereby increasing the healthfulness of this historic region.

CAMPAGNOLA, Domenico, Italian painter and engraver: flourished about 1520. He was probably born at Padua, where he was a rival of Titian in painting the frescoes in the Scuola del Carmine and in the Scuola del Santo. He is considered one of the best painters of the Venetian school, and his work as an engraver is less important. Of 14 engravings which are known to belong to him, 10 are dated 1517, and one, 'The Descent of the Holy Ghost,' bears the date 1518.

CAMPAN, käṅ-päṅ, **Jeanne Louise Henriette,** French authoress (GENEST): b. Paris, 6 Oct. 1752; d. Mantes, 16 March 1822. She became reader to the daughters of Louis XV; gained the favor of the wife of the Dauphin, afterward Queen Marie Antionette, who gave her in marriage to the son of her private secretary, M. Campan, and appointed her the first lady of the bed-chamber. Madame Campan gave her patroness many proofs of fidelity and attachment and wished to follow her into the temple after 10 Aug. 1792, which, however, Pétion did not allow. After the fall of Robespierre, Madame Campan established a boarding school for the education of young ladies at Saint Germain, which soon acquired a wide reputation. On this account Napoleon appointed her the principal of an institution founded by him for the daughters of the officers of the Legion of Honor, at Ecouen, which she organized and superintended for seven years. After the restoration Louis XVIII abolished the institution, and Madame Campan lost her situation. Her only son died in 1821, in consequence of ill treatment inflicted because he was a relation of Marshal Ney. She published 'Mémoires sur la vie privée de Marie Antoinette' (1823); 'Journal anecdotique' (1824); 'Correspondance inédite avec la reine Hortense' (1835); 'De l'éducation.' Consult Flamermont, Jules, 'Les mémoires de Madame de Campan' (Paris 1886).

CAMPANA, kăm-pä'ña, **Pedro** (in the Netherlands known as PETER DE KEMPENEER), Flemish painter of Spanish descent: b. Brussels 1503; d. there 1580. In 1530 he went to Italy for study of the Italian masters; he visited Venice under the patronage of Cardinal Grimiani, for whom he painted several pictures. At Bologna he painted some of the decorations of the triumphal arch for the reception of Charles V; he later lived in Seville, Cordova and other cities of Andalusia, and in 1562 returned to Brussels where he became chief engineer of the Duke of Alva, and in 1563 became art director and maker of cartoons for the Brussels tapestry works. In style he combined to some extent the characteristics of the school of Raphael and the Flemish painters. His best-known work is in the cathedral at Seville, the 'Descent from the Cross.' His 'Purification' and 'Resurrection' are also in the Seville Cathedral; other paintings of his are in the same city and he also painted the altar-piece of the church of Santa Anna in Triana, a suburb of Seville. The National Gallery, London, contains his 'Christ Preaching in the Temple.'

CAMPANARI, Giuseppe, Italian operatic baritone: b. Venice 1859. Both as orchestral 'cellist and concert singer, a member of the Boston Symphony Orchestra 1884–93, he became known to cultured musical circles, and attained national reputation by his appearance as *Tonio* in the first American production of 'Pagliacci.' He was a member of the Metropolitan Opera Company 1895–98, later confining himself to concert work with occasional appearances in opera. His musical career began as a 'cellist at La Scala Opera House, Milan, where he also studied singing.

CAMPANELLA, kăm-păn-ĕl'la, **Tommaso,** Italian philosopher: b. Stilo, Calabria, 5 Sept. 1568; d. Paris 1639. He displayed great quickness of parts when quite young, and at the age of 15 entered into the order of the Dominicans. He studied theology and other branches of knowledge with assiduity, but was principally attracted by philosophy. The opinions of Aristotle, then generally taught in the schools, appeared to him unsatisfactory; and in 1591 he published at Naples a work entitled 'Philosophia Sensibus Demonstrata,' intended to show the futility of the prevailing doctrines. He claimed that God alone is pure Being, and that being implies as its essence the power whereby it acts, the knowledge that reveals it to itself, and the love which inclines it to will its good. He held a political theory based on self-love and individual liberty. This book procured him some admirers, and more enemies. He then went to Rome, and afterward to Florence, where he was well received by the Grand Duke Ferdinand. In 1598 he returned to Naples, and revisited shortly after Calabria, where, in the following year, he was arrested on a charge of conspiracy against the Spanish government, to which Naples was then subject. A scheme was imputed to him of having engaged the Turks to assist him in making himself master of Calabria. On this improbable and apparently unfounded accusation he was imprisoned, and after being repeatedly tortured, condemned to perpetual confinement. In this situation he wrote many learned works, afterward published. At length, in 1626, Pope Urban VIII procured his removal to Rome, and in 1629 gave him his liberty, and bestowed on him a pension. Dreading some further persecution from the Spaniards, he withdrew in 1634 to France, where he was honorably received by Louis XIII and Richelieu, and much esteemed by the learned men of that country. He died at the monastery of his order. Campanella was a firm believer in astrology and magic. Among his numerous works may be mentioned 'Atheismus Triumphatus' (1631); 'Monarchia Messiæ' (1633); 'Prodromus Philosophiæ Instaurandæ' (1617); 'De Sensu Rerum et Magia' (1620); 'De Monarchia Hispanica Discursus' (1640); 'Realis philosophiæ epilogisticae partes quattuor, hoc est de rerum natura, hominum moribus, politica, cui Avitas solis adiuncta est, et Œconomica' (1622). A 'Life of Campanella,' by Baldacchini, was published at Naples (1840–43).

CAMPANERO. See BELL-BIRD.

CAMPANI-ALIMENIS, kăm-pä'nē ā-lē-mā'nĭs, **Matteo,** Italian mechanician: fl. 17th century. In optics, his greatest achievement was the manufacture of the object-glasses through which Cassini discovered two satellites of Saturn. He wrote 'Horologium solo naturæ motu' (1678), a work on the construction of clocks.

CAMPANIA, Italy, an ancient province of the Roman republic and empire, and a department of the modern kingdom of Italy, lying along the Tyrrhenian Sea and bounded on the land side by Latium, Samnium and Lucania, which, partly on account of its natural curiosities, including Vesuvius, the Phlegræan fields, the Lake of Avernus, and partly for its remarkable fertility, was a favorite resort of the distinguished Romans, who built there magnificent country houses. Cumæ, Puteoli, Naples, Herculaneum, Pompeii, Baiæ, Stabiæ, Salernum, Nola, Teanum, Venafrum and Capua, the principal cities of Campania, are names rich in classical associations. The Appian and Latin ways led into the interior of this charming province. The early inhabitants were of the Oscan race, who were displaced by the Greeks; the latter founding the cities of Cumæ and Neapolis. The Etruscans later obtained possession of it, but the Oscan element was still considerable and so remained until the country was entirely Romanized about 90 B.C. Cicero had a villa at Pompeii and under Augustus, Campania and Latium formed the first district of Italy. The vineyards of Mons Massicus and Ager Falernus were famous at an early period, as also the olives of Venafrum. Even now Campania is the most beautiful and fruitful part of Italy, and no traveler can wish for a more delightful country than the fields of Campania, filled in the month of April with barley four feet high, and adorned with lofty poplars, which are connected by luxuriant vines, forming a canopy over the fields. "There," says Goethe, "it is worth while to till the ground." The modern department of Campania includes the provinces of Avellina, Benevento, Caserta, Napoli and Salerno, covering an area of 6,227 square miles. Pop. (1 Jan. 1915) 3,426,754.

CAMPANILE, kăm-pä-nē'lạ, a detached tower containing bells. Campaniles are most common in Italy. Several of them have deviated considerably from the perpendicular, in consequence of their great height and narrowness of base. The earliest examples date from the 5th century and are circular in form, the most notable examples being those of the basilicas of Saint Apollinare Nuovo and Saint Appollinare in Classe at Ravenna. After the 8th century the square design prevailed. Brick was always used in Rome, while marble or stone entered into their composition in northern Italy. The campanile of Pisa, called *Torre Pendente* (or Leaning Tower), is one of the most remarkable. Its architects were Bonano of Pisa, and Willhelm of Innsbruck, and it was begun in 1174. The tower consists of eight stories, each of which is surrounded by columns, and it inclines nearly 13 feet from the perpendicular. Another celebrated campanile is that which was begun at Florence in 1334, after the designs of Giotto, and finished by Taddeo Gaddi. Its height approaches 300 feet, and it is adorned with 54 bas-reliefs, and 16 statues, representing biblical, pagan and allegorical subjects. Giotto intended to surmount this tower with a spire nearly 100 feet high, but his intention was never carried out. The Torre degli Asinelli and the Torre Garisenda at Bologna are also remarkable specimens of the campanile. The campanile of Saint Mark's Church, Venice, is probably the best known to Americans. Begun as far back as 888 by Pietro Tribuno, it did not assume the form which tourists are familiar with until 1590. For centuries its majestic height dominated the city. Its pinnacle was about 325 feet from the ground.

In 1417 a marble top was put on the old tower. One hundred years later it was crowned with the figure of an angel nearly 16 feet high. Simple in design, the campanile stood out in sharp contrast with the famous belfry of Florence.

The Loggetta at the foot of the campanile was built by the famous Jacopo Sansovino, and was the rendezvous for the nobles of the town. Sansovino adorned it with reliefs and with bronze statues of Minerva, Apollo, Mercury and Peace. The bronze doors of the vestibule have long been regarded as masterpieces that deserve to rank by the side of the work of the great Italian sculptors. Like many another Italian structure, the Loggetta lost much of its old-time significance. From a meeting-place for the nobles it degenerated into a waiting-room for commanders of the guards during the sessions of the great council. Latterly it was used for auctions and lottery drawings.

The tower was peculiar in that it had no staircase. It was ascended by a winding inclined plane, having 38 bends and ending in a few steps. The tower was always open; but visitors were not allowed to enter alone. For that reason a single traveler was compelled to engage a bystander to accompany him.

From time immemorial a watchman was stationed in the lantern. In the days of the grand maritime Venetian republic it was from the tower that the watchman caught the first glimpse of home-coming war vessels. In modern times the watchman no longer scanned the horizon for vessels, but kept a lookout upon the city for fires.

The campanile served other purposes as well. It was also used for the purpose which its name signifies. According to some authorities, four bells were hung in the olden days in the tower, to be sounded for different purposes. *La marangola* was sounded at dawn to call the laboring classes; *la sestamezzana* opened the official bureaus; *la trotterar* called the councils to duty; and the bell *del malefizio* tolled out the requiem for those who were put to death. A fifth bell was later brought from Candia and tolled only on Ascension Day. In 1518 there hung halfway up the tower a wooden cage, in which prisoners were kept until they were starved to death. Scientifically, the tower was of interest by reason of the fact that from it Galileo made many observations. On the morning of 14 July 1902, the campanile collapsed and fell with a great crash into the square. The church of Saint Mark and the palace of the Doges were not damaged, but the campanile in falling carried away the Sansovino Loggetta and the library of the Royal Palace. Steps were taken at once to rebuild and the cornerstone of the new edifice was laid on 24 April 1903. A strengthened pile foundation was put in place and the campanile re-erected in the form it had presented since being remodeled in 1517. A study of the data provided by the examination of the remains of the fallen tower showed that the bricks had been used for various purposes at a previous stage, in arches, fortifications, tops of walls, etc. The most important fact was that they were not Venetian, but Roman bricks. Moreover, when they were manufactured, they were not manipulated like modern bricks, but formed from slices of clay, as they were found without the natural layers being disturbed. This process resulted in each individual brick being able to support a weight quite four times as great as the modern brick. The bricks examined are of the 1st century. One bore the impression of a horseshoe, proving the debated point that horseshoes were then in use. In the Renaissance period a few campanili of note were erected; the finest is that of San Giorgio Maggiore by Palladio and Scamozzi in Venetia. It is of brick with a marble superstructure and has a spire. Modern examples of this kind of construction are the campanile of the Capitol at Rome, the Victoria Tower by Barry at the Houses of Parliament, Westminster, the great tower of the Basilique du Sacré Cœur, Montmartre, Paris, and the memorial tower in the Brown University campus at Providence, R. I.

CAMPANINI, kăm-pạ-nē'nē, **Italo**, Italian singer: b. Parma, 29 June 1846; d. Vigatto, 23 Nov. 1896. His father was a blacksmith. At 14 the boy enlisted in Garibaldi's army and served in two campaigns, after which he worked at his father's trade until the age of 18. Meanwhile, having shown that he possessed an excellent voice, he had taken singing lessons, and after spending a year at the Conservatory in Parma, he appeared in that city as the notary in 'La Sonnambula,' but suffered failure and ridicule. He still continued to sing in public, and in 1869 began to study under Lamperti, a celebrated teacher of Milan. In that city, at La Scala, he sang in 'Faust,' and immediately was acclaimed a great tenor. He appeared in London in 1872, and in the following year made his first visit to the United States, appearing with Nilsson at the Academy of Music, New York, in 'Lucrezia Borgia.' Afterward, in this country and Europe, he sang with great success, and was regarded as the foremost tenor of his time. The partial failure of his voice, mainly through an affection of the throat, caused some interruption of his career but scarcely diminished his popularity until near the close of his life.

CAMPANULA, BELL FLOWER, or **BELLWORT,** a genus of annual, biennial and perennial herbs of the family *Campanulaceæ*. The species, of which there are about 300, are almost all natives of the cooler parts of the northern temperate zone, and among them are some of the most widely grown garden plants, which are popular on account of their bell-shaped blue, violet or white flowers, and the ease with which they are cultivated. *C. rapunculus,* native of Europe, Asia and northern Africa, is known as rampion; the leaves and the radish-like roots are used for salads. *C. medium,* a European species, is the common Canterbury bells. *C. rotundifolia,* which occurs in Europe, Asia and North America, is the harebell or blue bells of Scotland, so frequently mentioned in literature. Several species are natives of North America.

CAMPANULACEÆ, a family of herbaceous and shrubby plants, generally abounding in a bitter, white juice. Their leaves are alternate and entire or toothed, rarely opposite. Their flowers usually form spikes, thyrsi or heads. They have a monosepalous calyx, with four, five or eight persistent divisions, and a regular, monopetalous, usually bell-shaped corolla, having its limb divided into as many lobes as there are divisions of the calyx. The stamens are five, the anthers free, or brought together in the form of a tube. The ovary is inferior or semi-inferior, with two or more cells, each containing numerous seeds. The style is simple, terminated by a lobed stigma, sometimes surrounded by hairs. The fruit is a capsule crowned by the limb of the calyx, with two or more cells opening either by means of holes which are formed near the upper part, or by incomplete valves. The seeds are very small and very numerous. These plants are chiefly natives of the temperate and colder climates of the northern hemisphere.

CAMPANULARIANS, or **SERTULARIANS,** hydroids of the order *Calyptoblastea,* formerly called Campanulariæ. They are always colonial and possess hydrothecæ, and in most cases give rise to a medusa, with auditory organs on the flaps. The ectoderm is protected by a horny or chitinous sheath (perisarc) enveloping the zooids. The hydroids retract, when disturbed, into small cups (hydrothecæ), arranged in opposite rows on the stalk as in *Sertularia,* or singly at the ends of the stalks, as in *Campanularia,* while the sheaths (gonothecæ) protecting the medusa-buds are distinguished by their much larger size and cup-shaped form. The Sertularians abound on seaweeds, and may be recognized from their resemblance to mosses. The medusæ of these and many other hydroids can be collected by a towing-net, and emptied into a jar, where they can be detected by the naked eye after a little practice. It is possible that the extinct palæozoic group, *Graptolites,* belong near the Campanularians, as they have a similar perisarc composed of cells (hydrothecæ). Consult Agassiz, A., 'North American Acalephæ' (Illustrated Catalogue of the Museum of Comparative Zoology at Harvard College, No. 2, Cambridge 1865); Agassiz, E. C. and A., 'Seaside Studies in Natural History' (Boston 1871); Nutting, 'American Hydroids' ('Special Bulletin of the U. S. National Museum': Washington 1900), contains a full bibliography.

CAMPARDON, kän-pär-dôṅ, **Emile,** French writer: b. Paris 1834. He was educated at the Ecole des Chartes, and then had charge of the archives there. In this position he had opportunity to examine the documents relating to the 18th century and the period of the French Revolution. He has written among other historical works 'History of the Revolutionary Tribunal of Paris' (1861); 'Marie Antoinette at the Conciergerie' (1862); 'Madame Pompadour and the Court of Louis XV' (1867); 'Unpublished Documents of J. B. Poquelin Molière'; 'Voltaire, Unpublished Documents'; 'The Royal Academy of Music in the 18th Century'; and 'Memoirs of Frederic III, King of Prussia' (with E. Boutaric).

CAMPBELL, Alexander, known as the founder of the Disciples of Christ or "Campbellites": b. Ballymeda, Antrim County, Ireland, 12 Sept. 1788; d. Bethany, Va., 4 March 1866. His mother's ancestors were French Huguenots. His father, Thomas Campbell, a clergyman and teacher in the Church of the Covenanters and Seceders, in April 1807 sailed from Londonderry to Philadelphia and located at Washington, Pa. (one year after the establishment of Washington College). Young Alexander embarked with the remainder of the family in October 1808, but was delayed by shipwreck on the coast of Scotland which gave him an opportunity to attend Glasgow University for a year. In August 1809 he again embarked with the family and after arriving at New York went directly via Philadelphia and over the mountains to Washington, Pa., where, under the direction of his father, he prepared for the ministry.

In March 1811, at West Liberty, Va., he married Miss Margaret Brown of Buffalo Creek, Brooke County, Va., and thereafter resided at the home of his father-in-law, from whom he later (1814) received a deed for the home property. Immediately, following his marriage he took steps to become naturalized. In the same year he was licensed to preach, and began near home a series of preaching tours. In 1812, after following his father in a movement to reunite different religious denominations, he took the lead in organizing the Disciples of Christ (q.v.), based on the doctrine that the Bible should be the only creed. Through his preaching tours, which in later years were gradually extended throughout the South and Middle West and eastward to Massachusetts Bay, he became widely known. He also won a wide reputation through his public debates with prominent Presbyterian ministers in 1820–23, and later through more famous debates with Robert Owen in 1829 and Archbishop Purcell in 1837. In 1818–19 he established Buffalo Seminary and sent for his father to assist in the work of instruction; and in 1823 he established the *Christian Baptist*, which in 1829 became the *Millennial Harbinger* and continued under his editorship until 1865. In 1827, finding it inconvenient to mail his letters and publications at West Liberty, he succeeded in establishing at his residence at Buffalo a post-office under the name of Bethany, which also became the name of the town later laid out by him (1847). He thus obtained the franking privilege which enabled him greatly to extend his correspondence. In 1829–30 he represented Brooke County in the Virginia Constitutional Convention. In the debates he took an active part in urging a system of free popular education and a more equitable representation of the western counties in the legislature. In 1840 beginning with an endowment from his own means, he founded Bethany College, which was opened in 1841, and he remained president of the institution until his death. In 1847 he visited England, France, Scotland and Ireland. In 1850 by invitation, in connection with one of his eastern trips, he made an address in the House of Representatives at Washington.

Campbell was a prolific writer and continued to write and preach until 1865. He published many religious volumes, including hymnbooks and a translation of the New Testament. In 1861 he published the 'Memoirs of Thomas Campbell,' his father and associate, who died at Bethany on 4 Jan. 1854.

CAMPBELL, Alexander, American politician: b. Concord, Pa., 4 Oct. 1814; d. La Salle, Ill., 9 Aug. 1898. He received a common-school education and entered the iron business, removing to Illinois and attaining prominence in local politics. He was mayor of La Salle, Ill., in 1852, a member of the Illinois legislature in 1858 and a member of Congress in 1875. He was widely known as the "father of the Greenback party."

CAMPBELL, Sir Alexander, Canadian statesman: b. Yorkshire, England, 9 March 1822; d. Toronto, 24 May 1892. He began the practice of law in 1843 as a partner of Sir John A. Macdonald. In 1858 he entered the legislative council, and in 1863 was elected speaker. In 1864–67 he was commissioner of Crown lands. He was a delegate to the Confederation conferences in 1864, received a nomination to the Dominion Senate (1867), where he was the government leader, and was Postmaster-General in the first Federal Cabinet. In 1873 he became Minister of the Interior. With the other Cabinet officers, he resigned in the same year on account of the Pacific Railroad scandal. On the return of Macdonald to power, he was successively Receiver-General of Militia and Defense and Postmaster-General. From 1881–85 he was Minister of Justice, and from 1887–92 lieutenant-governor of Ontario. He represented Canada at the Colonial Conference held in London in 1887. He was created K.C.M.G. in 1879.

CAMPBELL, Archibald. See ARGYLE, CAMPBELLS OF.

CAMPBELL, Bartley, American dramatist: b. Allegheny City, Pa., 12 Aug. 1843; d. Middletown, N. Y., 30 July 1888. He engaged in journalism early in his career and established the *Evening Mail* in Pittsburgh (1868) and the *Southern Magazine* in New Orleans (1869). His first drama that met with success in New York was 'My Partner,' appearing in 1879. 'Fairfax, or Life in the Sunny South,' and 'The Galley Slave,' were on the metropolitan boards during the same season. Included in his plays are 'Matrimony'; 'The White Slave'; 'Siberia'; and 'Paquita.' Several of his plays were brought out in England. He was manager of the Fourteenth Street Theatre, New York, for some time. He became insane in 1886 and died in an asylum.

CAMPBELL, Beatrice Stella Tanner (MRS PATRICK CAMPBELL), English actress: b. London 1867; married in 1884 to Patrick Campbell, who was killed in 1900 in the Boer War. Her first appearance on the professional stage was made in 1888 at the Alexandra Theatre in Liverpool. She has been particularly successful in such plays as 'The Second Mrs. Tanqueray,' 'John-a-Dreams' and 'The Notorious Mrs. Ebbsmith.' She has also appeared in such Shakespearean rôles as Juliet, Ophelia and Lady Macbeth in conjunction with Sir Johnston Forbes-Robertson; and has played Mélisande to the Pelleas of Sarah Bernhardt. She has frequently visited the United States, playing in most of the leading cities. She married in 1914 George Cornwallis-West.

CAMPBELL, Sir Colin, English soldier and administrator: b. 1776; d. 1847. He was first a midshipman; then entered the army, fought with Wellesley in India, 1801–04, and was present at the battle of Assaye. He served also in Denmark and the Peninsula, and was on Wellington's staff at the battle of Waterloo. He was lieutenant-governor of Nova Scotia, 1834–40, and of Ceylon, 1839–47.

CAMPBELL, Sir Colin (LORD CLYDE), British general: b. Glasgow, 20 Oct. 1792; d. 14 Aug. 1863. His father was a carpenter, named Macliver. He was educated at the expense of his mother's brother, Col. John Campbell, and owing to an error of the Duke of York's when the youth was introduced to him as a candidate for a commission, assumed the name of Campbell. Entering the army in 1808, and serving in the Peninsular War (1810–13), he was severely wounded at the siege of San Sebastian and the passage of the Bidassoa. He served in Nova Scotia in 1814, and then passed nearly 30 years in garrison duty at Gibraltar, Barbadoes, Demerara and various places in England, in 1837 becoming lieutenant-colonel of the 98th Foot. He served in India previous to the Crimean War, on the outbreak of which, in 1854, he was appointed to the command of the Highland brigade. The victory of the Alma was mainly his; and his, too, the splendid repulse of the Russians by the "thin red line" in the battle of Balaklava. When, on 11 July 1857, the news reached England of the Sepoy mutiny, Lord Palmerston offered him the command of the forces in India. He effected the relief of Lucknow on 19 March 1858, and succeeded in quelling the mutiny. He was created Baron Clyde in July of the same year.

CAMPBELL, Colin, Scottish clergyman and Egyptologist: b. Campbelltown, Argylshire, 1848. He was educated at the universities of Edinburgh and Heidelberg, entered the ministry of the Established Kirk of Scotland, and has been minister of the parish of Dundee from 1882. He preached nearly every year from 1883 to 1900 before Queen Victoria at Balmoral Castle and Crathie Parish Church, and has published 'The First Three Gospels in Greek'; 'Critical Studies in Saint Luke's Gospel' (1891); 'Two Theban Queens' (1909); 'Two Theban Princes' (1910); 'The Miraculous Birth of King Amon-hotep III and Other Egyptian Studies' (1912).

CAMPBELL, Douglas Houghton, American educator: b. Detroit, Mich., 16 Dec. 1859. He was graduated at the University of Michigan in 1882 (Ph.D. in 1886), and then studied in Europe for four years. Returning he was professor of botany in the University of Indiana till 1891, when he was called to the similar chair in Stanford University. He is author of 'Elements of Structural and Systematic Botany' (1890); 'Structure and Development of Mosses and Ferns' (1895); 'Lectures on the Evolution of Plants' (1899); 'A University Textbook of Botany' (1902); 'Plant Life and Evolution' (1911).

CAMPBELL, Edward de Mille, American industrial chemist: b. Detroit, Mich., 9 Sept. 1863. He studied at the University of Michigan, and after serving as chemist to the Ohio Iron Company in 1886, to the Sharon Iron Company, Pennsylvania, in 1887, to the Dayton Coal and Iron Company, Tennessee, in 1888, from assistant professor in 1890 he advanced to the position of director of the chemical laboratory at his *alma mater,* the University of Michigan, in 1905.

CAMPBELL, George, Scottish clergyman: b. Aberdeen, 25 Dec. 1719; d. 6 April 1796. He was educated at Marischal College, and afterward articled to a writer of the signet at Edinburgh. In 1741 he relinquished the law and studied divinity at Aberdeen. He was ordained in 1748, became pastor of a church in Aberdeen 1757, where he was a fellow member of Thomas Reid in a philosophical society, and in 1759 was appointed principal of Marischal College. In 1763 he published his celebrated 'Dissertation on Miracles,' in answer to Hume's essay. In 1771 he was chosen professor of divinity, and in 1776 gave to the world his 'Philosophy of Rhetoric,' which established his reputation as a grammarian and critic. His 'New Translation of the Gospels' appeared in 1778. Consult the biography by Keith prefixed to Campbell's 'Lectures on Ecclesiastical History' (London 1800).

CAMPBELL, Sir George, English administrator and author: b. 1824; d. London, 18 Feb. 1892. He was educated at Haileybury for the East Indian service and held several important posts under the Indian government. He represented the Kirkcaldy burghs in the House of Commons in the Liberal interest from 1875 until his death. The success that had attended him as an administrator in India did not follow him as a politician. He published 'India as It May Be'; 'The Ethnology of India' (1865); 'Handy Book of the Eastern Question' (1876); 'Black and White in the United States'; 'The British Empire' (1887); 'Memoirs of My Indian Career' (1893).

CAMPBELL, Harry, English physician: b. Margaretting, Essex, England. He studied medicine at Saint Bartholomew's Hospital College and was appointed to the staff of Northwest London Hospital, 1886, and that of Welbeck Street Hospital, 1896. He has published 'The Physiology of Eyesight' (1885); 'The Causation of Disease' (1889); 'Flushing and Morbid Blushing' (1890); 'Differences in the Nervous Organization of Man and Woman' (1891); 'Headache and Other Morbid Cephalic Sensations' (1894); 'Respiratory Exercises in the Treatment of Disease' (1898); 'On Treatment' (1907).

CAMPBELL, Helen Stuart, American author: b. Lockport, N. Y., 4 July 1839. She was educated at Mrs. Cook's Seminary, Bloomfield, N. J., 1850–58, and very early began contributing to periodicals. From 1881 to 1884 she edited *Our Continent* (Philadelphia). Her especial interest has been in social and domestic questions, such as the condition of the poor, household management, etc., and her writings for the most part consist of essays and stories illustrating these topics. Chief among them are 'The Ainslee Series' (1864–67); 'Six Sinners' (1878); 'Unto the Third and Fourth Generation' (1880); 'Under Green Apple Boughs' (1881); 'The Easiest Way in Housekeeping and Cooking' (1881); 'The Problem of the Poor' (1882); 'Mrs. Herndon's Income: a Novel' (1885); 'Prisoners of Poverty' (1887); 'Prisoners of Poverty Abroad' (1889); 'Roger Berkeley's Probation' (1891); 'Anne Bradstreet and Her Time' (1892); 'Women Wage-Earners' (1893); 'In Foreign Kitchens' (1894); 'Some Passages in the Practice of Dr. Martha Scarborough' (1893); 'Ballantyne: a Novel' (1901).

CAMPBELL, Henry Donald, American scientist: b. Lexington, Va., 29 July 1862. He was graduated at Washington and Lee University in 1882; later studied at Berlin and Heidelberg, and in 1887 became professor of geology and biology at Washington and Lee University. He was made dean in 1906 and was acting president of the university January to July 1912.

CAMPBELL, James Edwin, American politician: b. Middletown, Ohio, 7 July 1843. After an academic education he was admitted to the bar. During the Civil War he served for a time in the navy and was with the Mississippi and Red River flotillas. He was a Democratic member of Congress, 1883–89; governor of Ohio, 1890–92. He was defeated for re-election by William McKinley, afterward President of the United States. In 1895 he was again a candidate, but was defeated by A. S. Bushnell.

CAMPBELL, James Mann, Scottish-American clergyman: b. Scotland, 5 May 1840. He received his education at the universities of Edinburgh and Glasgow, and in 1874 came to the United States. He has lectured much on religious themes and has published 'Unto the Uttermost' (1889); 'The Indwelling Christ' (1895); 'After Pentecost, What?' (1897); 'The Teachings of the Books' (1899); 'Clerical Types' (1900); 'Bible Questions'

(1900); 'Paul the Mystic' (1907); 'The Heart of the Gospel' (1907); 'Grow Old Along With Me' (1911); 'The Presence' (1911); 'The Place of Prayer in the Christian Religion' (1914).

CAMPBELL, James Valentine, American jurist: b. Buffalo, N. Y., 25 Feb. 1823; d. Detroit, Mich., 26 March 1890. His family moved to Detroit in 1826. He was graduated at Saint Paul's College, L. I., in 1841; was admitted to the Michigan bar, 1844; practised with success until 1857. He was then elected a judge of the Supreme Court of Michigan, re-elected at every succeeding election, and was chosen chief justice for nine terms in succession. From 1859 he lectured for 20 years in the law department of the University of Michigan. Much of his leisure was devoted to literary and historical studies, especially the history of Michigan and the Northwest Territory. Until 1854 he was a Whig, but thereafter acted chiefly with the Republicans. He wrote 'Outlines of the Political History of Michigan' (1876).

CAMPBELL, John, American editor: b. Scotland 1653; d. March 1728. He was one of a family or kin of Boston booksellers and public officials whose relationships are not determinable. John, as postmaster, was the news centre of the New England provinces; and in 1703 was writing "news letters" of European news to Governor Winthrop of Connecticut, and perhaps to other governors, made up of information received from arriving travelers, etc., with inferences as to New England policy. In 1704 he concluded to make these public and for sale; and on 24 April issued the first newspaper in America, the Boston *News Letter* (q.v.), which he edited till 1722. In 1719 he was deprived of the postmastership. He was justice of the peace for Suffolk County for some years.

CAMPBELL, John. See ARGYLE, CAMPBELLS OF.

CAMPBELL, John, British historian: b. Edinburgh, 8 March 1708; d. 28 Dec. 1775. His writings before 1742 were published anonymously. From 1755 to the close of his life he was agent of the British government for the province of Georgia. Among his works are 'A Concise History of Spanish America' (1741); 'Lives of the English Admirals' (1744); 'A Survey of the Present State of Europe' (1750); and 'Trade of Great Britain to America' (1772). He also wrote many of the biographies in the 'Biographia Britannica,' and Samuel Johnson makes many allusions to his erudition and popularity.

CAMPBELL, John (BARON), Lord High Chancellor of England: b. Springfield, near Cupar, county of Fife, Scotland, 15 Sept. 1779; d. 22 June 1861. He was educated at the grammar school of Cupar, and at 12 entered the University of Saint Andrews (1791) for the purpose of studying for the Church. After remaining, however, for some years at college, he resolved to abandon the clerical profession, and determined to try his fortune in London. In 1798 he quitted his native country for the metropolis, where he became reporter and theatrical critic on the *Morning Chronicle*. In November 1800 he entered as a student of Lincoln's Inn, and in 1806 was called to the bar. He traveled the Oxford circuit, and obtained considerable practice. In 1830 he was elected member of Parliament for Stafford, and in 1832 was appointed solicitor-general In 1834, on the retirement of Sir William Horne, he became Attorney-General, and the same year was elected one of the members of Parliament for the city of Edinburgh, serving till 1841, when he was created chancellor of Ireland, and raised to the peerage as Baron Campbell of Saint Andrews. He had scarcely, however, assumed his official duties in Ireland, when he quitted office with the Melbourne ministry; and having now more leisure worked on his 'Lives of the Chancellors,' the first series of which was published early in 1846. On the accession of Lord John Russell to power in that year Lord Campbell accepted the chancellorship of the duchy of Lancaster, but still continued his literary labors, completing, in seven volumes, his 'Lives of the Chancellors,' and adding two other supplemental volumes, entitled 'Lives of the Chief Justices of England.' In 1850, on the retirement of Lord Denman, he was appointed chief justice; in 1859, on Lord Palmerston's resumption of the Premiership, Lord Campbell reached the highest legal dignity in the British empire, becoming Lord High Chancellor. Consult 'Life of Lord Campbell,' by his daughter, the Hon. Mrs. Hardcastle.

CAMPBELL, John Archibald, American lawyer: b. Washington, Ga., 24 June 1811; d. Baltimore, 12 March 1889. He was graduated from the Georgia University in 1826 and was admitted to the bar in 1829 before coming of age, by virtue of a special act of the legislature. Removing to Alabama he soon became prominent in his profession, and in 1853 was appointed associate justice of the Supreme Court of the United States, resigning in 1861. He was subsequently appointed Confederate Secretary of War, and was one of the commissioners named by President Davis to meet President Lincoln and Secretary Seward at the conference in Fortress Monroe in February 1865. He was imprisoned for some months after the close of the Civil War and on his release resumed his legal practice.

CAMPBELL, John Douglas Sutherland. See ARGYLE, CAMPBELLS OF.

CAMPBELL, John Lyle, American chemist: b. Rockbridge County, Va., 7 Dec. 1818; d. Lexington, Va., 2 Feb. 1886. He was graduated at Washington College (now Washington and Lee University) in 1843. On leaving college he became assistant in the academy at Staunton, Va., and afterward had charge of a similar institution in Richmond, Ky. In 1851 he was called to the chair of chemistry and geology at Washington College, an office which he continued to occupy until his death. He was a recognized authority on the geology of Virginia, and wrote reports on that subject as well as frequent contributions to the scientific journals. Among his larger works are 'Geology and Mineral Resources of the James River Valley' (1882), and 'Campbell's Agriculture: a Manual of Scientific Agriculture for the School and Farm' (Philadelphia 1859).

CAMPBELL, Lewis, British classical scholar: b. Edinburgh, 3 Sept. 1830; d. Lago Maggiore, 25 Oct. 1908. He received his early education at Edinburgh Academy, and afterward attended the University of Glasgow and Trinity and Balliol colleges, Oxford. Ordained in 1857, he became vicar of Milford, Hants, in the following year, a post which he held till his appointment, in 1863, as professor of Greek in Saint Andrew's University, a position he held until 1892. The 1894–95 series of Gifford Lectures at Saint Andrews was delivered by him. As a writer he is known mainly by his editions and translations of ancient Greek authors, the chief of which are Plato's 'Theætetus' (1861); Plato's 'Sophistes and Politicus' (1867); 'Sophocles—The Plays and Fragments' (1879); 'Sophocles in English Verse' (1873–83); 'Æschylus in English Verse' (1890); and Plato's 'Republic' (with Benjamin Jowett 1894); 'Tragic Drama in Æschylus, Sophocles and Shakespeare' (1904); 'Paralipomena Sophoclea' (1907). 'The Christian Ideal,' published in 1877, is a volume of sermons; and his other works include a 'Guide to Greek Tragedy' (1891); 'Life of James Clerk Maxwell' (with W. Garnett 1882); 'Life of Benjamin Jowett' (with E. Abbott 1897); 'Religion in Greek Literature' (1898), the substance of his Gifford Lectures.

CAMPBELL, Mrs. Patrick. See Campbell, Beatrice.

CAMPBELL, Reginald John, English Congregational clergyman: b. London, 1867. After receiving a collegiate training at University College, Nottingham, and Christ Church College, Oxford, he entered the Congregational ministry in 1895. He first held the pastorate of the Union Church, Brighton, where he quickly acquired celebrity as a preacher. He succeeded Dr. Parker at the City Temple, London, in 1903, continuing there until his resignation in 1915. For a time his attitude to the fundamental doctrines of Christianity occasioned alarm among orthodox Congregationalists, his 'New Theology' (1907), which set ethics above dogma, being especially the centre of attack. By 1915 he had swung in the other direction, for in October of that year he announced his intention of seeking orders in the Anglican Church, and was ordained to the diaconate at Birmingham, 24 Feb. 1916. He has published 'The Making of an Apostle'; 'The Restored Innocence' (1898); 'A Faith for To-day' (1900); 'Christianity and the Social Order' (1908); 'Thursday Mornings at the City Temple' (1908).

CAMPBELL, Robert, British fur trader and explorer: b. Glenlyon, Scotland, 1808; d. 1894. He entered the service of the Hudson's Bay Company in 1832; and in 1838 began a series of explorations in the Northwest, in the course of which he discovered Frances Lake, the Pelly and Lewes rivers and the upper Yukon, which he traversed under the impression that it was the Colville, but the identity of which he subsequently established.

CAMPBELL, Thomas, British poet: b. Glasgow, 27 July 1777; d. Boulogne, France, 15 June 1844. He was educated at the University of Glasgow, where he distinguished himself by the excellence of his poetical translations from the Greek. After leaving the university he resided for a short time in Edinburgh; and sprang suddenly into fame by publishing, in 1799, 'The Pleasures of Hope.' It produced an extraordinary sensation, and soon became a familiar book throughout the kingdom. This was due not more to the graces of its style than to the noble purity of its thoughts. After the publication of 'The Pleasures of Hope' he went to Germany, where he met Klopstock at Hamburg, and visited the scene of the battle celebrated in 'Hohenlinden,' one of the most famous of his poems. The appearance of the English fleet caused him to leave Altona, where he had resided for some time. During this tour several of his best lyrics were written or suggested, among them 'The Exile of Erin,' 'Ye Mariners of England' and 'The Battle of the Baltic.' In 1803 a new edition of 'The Pleasures of Hope,' with other poems, appeared, and in that year he married. Settling in London, he devoted himself to literary work, and in 1805 obtained a pension of £200, through the influence of Fox, of whose politics he was an admirer. After this he appears for a time to have given his attention less to poetry than prose, but in 1809 he again made his appearance as a poet, and published 'Gertrude of Wyoming,' which some eminent critics have considered superior to 'The Pleasures of Hope.' In 1814 he visited Paris, and in the following year he received a legacy of over £4,000. In 1819, by his 'Specimens of the British Poets,' accompanied with critical essays, he proved himself the possessor of great critical acumen and an admirable prose style. In 1820 he became editor of the *New Monthly Magazine,* a position which he held till 1830. As an editor he was a signal failure. In 1824 he published 'Theodoric,' which, though not devoid of fine passages, scarcely sustained his reputation. For many years he took an active interest in the emancipation of Greece and Poland, and in the foundation of the London University, of which he considered himself the originator. He was lord rector of the University of Glasgow from 1826 to 1829. In 1828 his wife died, and thenceforth his vigor, both bodily and mental, began to decline; and though he afterward published 'Letters from the South' (1837), describing a visit which he had paid to Algiers, a 'Life of Mrs. Siddons' (1834–42), and a 'Life of Petrarch,' and either wrote or edited the 'Life and Times of Frederick the Great,' he failed to equal his more youthful efforts. In 1831–32 he was editor of the *Metropolitan Magazine,* and in 1832 he founded the Polish Association. Among his works not mentioned above are 'The Advent,' a hymn; 'Love and Madness'; 'Lord Ullin's Daughter'; 'The Wounded Hussar'; 'Gilderoy'; 'The Soldier's Dream'; 'Judith'; 'The Name Unknown'; 'The Turkish Lady'; 'Lochiel's Warning'; The Rainbow'; 'The Last Man'; 'Navarino'; 'Pilgrim of Glencoe'; 'Moonlight,' etc. See Beattie, 'Life and Letters of Thomas Campbell'; and Redding, 'Literary Reminiscences of Campbell.'

CAMPBELL, Thomas W., American clergyman: b. Three Rivers, Quebec, Canada, 24 Sept. 1851. He was graduated at Victoria University in 1879, and became a Methodist minister. Joining the Reformed Episcopal Church, he was elected a bishop in 1891, and presiding bishop in 1894. In 1895 he moved to Brooklyn, N. Y., to become pastor of the Reformed Episcopal church of the Reconciliation, and resigned to enter the Presbyterian Church in 1898. In October 1899 he became pastor of the Noble Street Church, Brooklyn, N. Y.; resigned October 1905; organized Stony Brook Association and Assembly; secretary and manager till May 1915.

CAMPBELL, William, American soldier: b. Augusta County, Va., 1745; d. Rocky Mills, Va., 22 Aug. 1781. He was of Scottish descent. Commissioned a captain in the first regular troops raised in Virginia in 1775, and later becoming a colonel of militia, he distinguished himself greatly in the battles of King's Mountain and Guilford Court-House. His military career was short but brilliant, and on all occasions marked by conspicuous bravery. Lafayette gave him the command of a brigade of riflemen and light infantry. Washington, Gates and Greene, the Virginia legislature and the Continental Congress expressed their high sense of his merits and services. He was taken fatally ill a few weeks before the siege of Yorktown. He married a sister of Patrick Henry. Consult Warfield, E. D., (in the *Magazine of Western History,* January, 1887).

CAMPBELL, William (LORD), English royal governor of South Carolina: b. (?); d. 5 Sept. 1778. He was the youngest son of John, 4th Duke of Argyle. He received a captaincy in the British navy, 20 Aug. 1762; was a member of Parliament in 1764, and governor of Nova Scotia, 1766–73. In 1774 he was appointed governor of South Carolina, entered upon his duties in June 1775, was courteously received by the people, for whom he professed great friendship. The hollowness of his promises was soon proved, however, and finding his residence in Charleston unsafe, he fled on board a British man-of-war, where he was soon joined by his wife, who was a Miss Sarah Izard, sister of the patriot, Ralph Izard, who belonged to the wealthiest family in the province. In 1776 Campbell served as a volunteer on board Sir Peter Parker's flagship, *Bristol,* in the attack on Fort Sullivan, 28 June, and was severely wounded early in the action, while in command of the lower deck. He ultimately died from the effects of the wounds received at this time. Consult McCrady, 'The History of South Carolina in the Revolution' (Vol. I, 1901).

CAMPBELL, William B., American soldier and statesman: b. Sumner County, Tenn., 1 Feb. 1807; d. near Lebanon, Tenn., 31 Aug. 1867. He was educated in Abingdon, Va., and studied law at Winchester, Va., in the then noted law school of the Hon. St. George Tucker. He began the practice of his profession in 1829 at Carthage, Tenn., was elected attorney-general of his district in 1830, a member of the legislature in 1835. He resigned and raised a company of dragoons to serve in the war with the Indians in Florida in 1836. In this year also he formed a volunteer company, of which he was made captain, and fought in the Creek and Seminole War as part of the 2d Tennessee Volunteers under Col. William Trousdales. In 1837 Captain Campbell was elected to the United States Congress and served four terms successively. In 1844–45 he served as major-general of his military division. He was colonel of the 1st Tennessee Regiment in the Mexican War. He was present at Matamoras (Palo Alto), Monterey, where he was conspicuous for his gallantry. He was at Vera Cruz on 22 March 1847 and at Cerro Gordo, 18 April 1847. In all he displayed unflinching courage and great capacity as commander. On his return to Tennessee Colonel Campbell was elected unanimously circuit judge in his native place. He held the post for several years, filling it with dignity and wisdom. In 1851 he was elected governor of Tennessee, serving one term and declining re-election. He was a member of Congress in 1865–66. In his public life he escaped to a marked degree the censures and criticism incident to public station, as a result of his integrity and untiring devotion to duty.

CAMPBELL, William Wallace, American astronomer: b. Hancock County, Ohio, 11 April 1862. After graduation from the University of Michigan he was professor of mathematics at the University of Colorado in 1886–88, and instructor in astronomy and assistant in Detroit Observatory, University of Michigan, in 1888–91, making a specialty of comet observations and orbit computation. He became astronomer in 1891, and director in 1901 of the Lick Observatory, and also had charge of eclipse expeditions to India, Spain and Flint Island. He received several medals in recognition of his work, including the Janssen prize of the Paris Academy of Sciences in 1910 and the Bruce gold medal in 1915. Besides many papers on the motion of solar eclipses, stars, comet orbits and on the spectra of nebulæ, comets and stars, he has published 'The Elements of Practical Astronomy' (1900); 'The Return of Halley's Comet' (1909) and 'Stellar Motions' (1912).

CAMPBELL, William Wilfred, Canadian poet: b. Berlin, Ontario, Canada, 1 June 1861. He was educated at Toronto University and the Episcopal Theological School, Cambridge, Mass., and was for some years in the Episcopal ministry in Canada, retiring from it in 1891 in order to devote himself entirely to literary pursuits. He has published 'Lake Lyrics' (1889); 'The Dread Voyage' (1893); 'Mordred, a Tragedy,' and 'Hildebrand' (1895), the latter two being dramas in blank verse; 'Beyond the Hills of Dream' (1899); 'Sagas of Vaster Britain' (1906); and the novels, 'Ian of the Orcades' (1906); 'A Beautiful Rebel' (1909), and 'The Canadian Lake Region' (1910).

CAMPBELL-BANNERMAN, SIR Henry, English statesman: b. 7 Sept. 1836; d. London, 22 April 1908. He was the son of Sir James Campbell, but added the surname Bannerman, under the will of a maternal uncle. In 1868 he was elected member of Parliament for Stirling borough. From 1871–74, and from 1880–82, he was financial secretary of the War Office; 1882–84, Secretary of Admiralty; 1884–85, Chief Secretary for Ireland; 1886 and 1892–95, Secretary of War. In February 1899 he became leader of the Liberal party; on 4 Dec. 1905 succeeded Sir Arthur Balfour as Premier. He distinguished himself by his patience and common sense. He gathered about him a ministry of very able people, including for the first time a representative of the labor department in Mr. John Burns. He resigned the Premiership in April 1908. Consult McCarthy, 'Sir Henry Campbell-Bannerman' (New York 1903); Channing, 'Sir Henry Campbell-Bannerman' in the *Fortnightly Review* (Vol. LXXXIX, London 1908).

CAMPBELL ISLAND, a lonely island in the Pacific Ocean in lat. 52° 32′ S., long. 169° 9′ E., 36 miles in circumference. Though very mountainous, it has several good harbors. It is a dependency of New Zealand and 180 miles southeast of the Auckland Islands. It is volcanic, with a rich and rare flora.

CAMPBELLFORD, Canada, town in Northumberland County, Ontario, beautifully situated on the Grand Trunk Railway, 32 miles west of Belleville and on the Trent Valley Canal. It manufactures woolens, has pulp, paper and flour mills, bridge works and shoe factory. Pop. (1911) 3,051.

CAMPBELLITES, followers of Rev. John McLeod Campbell, who was deposed from the Church of Scotland in 1831 for teaching the universality of the atonement. He established a church at Glasgow in 1833. The name is also applied to members of the Church founded in the United States by Alexander Campbell. See DISCIPLES OF CHRIST.

CAMPBELL'S STATION, Tenn., the scene of an engagement between Federal and Confederate forces, 4 Nov. 1863. Gen. Braxton Bragg, who was besieging Chattanooga, detached Longstreet's corps of 10,000 men and 35 guns, with Wheeler's cavalry force of 5,000 men, to capture Burnside or drive him out of East Tennessee. Longstreet reached the south bank of the Tennessee, near Loudon, on the 13th, and that night and next day laid bridges at Huff's Ferry, two miles below Loudon, and began crossing his infantry. Burnside, who was holding the north bank of the river from Kingston to Lenoirs, concluded to leave one brigade at Kingston and retire the rest of his command to Knoxville, about 30 miles, where he had prepared to make a stand behind defensive works. He skirmished sharply with Longstreet's advance on the 14th and gradually falling back on the 15th, at night concentrated Hartranft's and Ferrero's divisions of the 9th corps and White's of the 23d, at Lenoirs. He had about 5,000 men. Longstreet followed, attacked during the night and was repulsed. Before daybreak of the 16th Hartranft, with his division and some cavalry, was put on the march to secure Campbell's Station, the intersection of roads coming from the south. After destroying many wagons and contents, taking the teams to assist his artillery over the bad roads, axle-deep in mud, Burnside followed with the other two divisions, artillery and trains, closely pursued by Longstreet, with Hood's division, commanded by Gen. Micah Jenkins, with whose advance his rearguard had several sharp encounters. McLaws' division of Longstreet's corps took a more direct road to the left, the two roads intersecting about a mile southward of Campbell's Station, 15 miles south of Knoxville. Hartranft reached the coveted point in advance of McLaws and, turning west on the Kingston road, deployed his division in such manner as to confront McLaws, and at the same time cover the Lenoir road, along which the trains were moving in advance of the infantry. He had scarcely made his dispositions when McLaws appeared and attacked, but Hartranft held on until Burnside, with the trains and the remainder of the troops, had passed and the troops taken position, when he fell back and formed on the left of White's division, in position half a mile beyond the junction of the two roads, Ferrero's division on White's right, and the artillery on commanding ground sweeping the road and the open country in front. The jaded train continued on the road to Knoxville. McLaws advanced and drew up in the plain, but the forbidding aspect of Burnside's artillery, which opened viciously on him, forbade direct attack with infantry, whereupon he opened with artillery, and Longstreet ordered attacks upon both flanks of Burnside's line, which were made and nicely parried or repulsed; but, largely superior in numbers, Longstreet was able to move around both flanks, especially on Burnside's left, which obliged him to fall back to a ridge nearly a mile in the rear. This he did in a handsome manner, though under a heavy and constant fire, and closely pressed on all sides. It was four o'clock when Hood's division made an attack on Burnside's left, which was repulsed. McLaws attacked his right and was thrown back, and Longstreet then prepared for a general advance of his entire line, but before his preparations were completed it was becoming dark and his train secure and well on the way to Knoxville. Burnside, after dark, resumed his march. His advance reached Knoxville about daybreak next morning, 17 November, Longstreet wearily following during the day, and the siege of Knoxville began. In this action at Campbell's Station and the skirmishes preceding it at Huff's Ferry, Lenoirs, and on the march, the Union loss was 303 killed and wounded, and 135 missing. The Confederate loss is not definitely known. Hood's division, the most seriously engaged, lost 174 killed and wounded; the loss of McLaws was much less. Consult 'Official Records' (Vol. XXXV); the Century Company's 'Battles and Leaders of the Civil War' (Vol. III); Woodward's 'Burnside and the 9th Army Corps.'

CAMPBELLTON, Canada, seaport in Restigouche County, New Brunswick, on the Intercolonial Railway. It is the northernmost town in the province and a great centre for hunters of game. Light and water are municipally owned. Its industries include foundry and machine shops, lumber, shingle and planing mills, woodworking factories, etc. Pop. 3,817.

CAMPBELTOWN, Scotland, seaport and popular summer resort, famed for its scenic and historic attractions, in Argyllshire, on a fine bay indenting the southeast point of the Kintyre peninsula, 82 miles by water southwest of Glasgow. Whisky distilling is the chief industry, producing annually over 2,000,000 gallons, half of which is exported. Coal is mined, woolens manufactured, shipbuilding with allied industries carried on and the fisheries are important. The walls remain of the ancient church founded by Saint Columba, and the sculptured granite cross of archæological fame, from Iona, stands in the principal street. An ancient stronghold of the Macdonald of the Isles, here in 1647 at Dunaverly Castle 300 of the Macdonalds were slain after their surrender. Pop. 9,500.

CAMPE, kăm'pē, **Joachim Heinrich,** German teacher and juvenile author: b. Deensen, Brunswick, Germany, 29 June 1746; d. 22 Oct. 1818. He studied at Halle for the Church, acted for some time as a teacher in various positions. He ardently supported the education reforms of Basedow whom he succeeded during the year 1777 as the head of the Philanthropenum in Dessau. In 1786 he was chosen by the government of Brunswick to superintend and reform the schools of that duchy, but his radical views brought him into conflict with the Church and government and he was unable to put them through. He became likewise the head of a schoolbook publishing house at Brunswick, and his own works, which were issued from it, contributed greatly to extend its reputation. These consist principally of educational works and books for youth, the most successful being ‘Robinson Crusoe der Jüngere,’ an adaptation of Defoe's ‘Robinson Crusoe.’ This attained an immense popularity, being translated into almost all the languages of Europe. He also wrote a ‘History of the Discovery of America.’ Consult Leyser, ‘Joachim Heinrich Campe’ (2 vols., 2d ed., 1896).

CAMPECHE, or **CAMPEACHY**, Mexico, seaport town in the state and on the bay of the same name, on the west coast of the peninsula of Yucatan, about 100 miles southwest of Merida, with which it is connected by railroad. Under the Spanish régime Campeche was one of the three open ports of this coast, and its general appearance still gives evidence of its former wealth and importance. Founded in 1540 on the site of a native village, of which there are interesting remains, the city has witnessed many important events down to the revolution of 1842. It contains a citadel, a university with a museum, a hospital and a handsome theatre. Campeche is an important mart for logwood or Campeachy wood, of which great quantities are exported. Other important exports are wax, cigars and henequen or sisal-hemp, sugar, salt, mahogany and hides. Owing to the shallowness of the roadstead large vessels have to anchor five or six miles off. There is a lighthouse on the coast at this port. Pop. 17,109. The state of Campeachy has an area of 18,091 square miles. Pop. 87,000. The Bay of Campeachy, part of the Gulf of Mexico, lies on the southwest of the peninsula of Yucatan, and on the north of the province of Tabasco.

CAMPEGGIO, kăm-pĕj'ō, or **CAMPEGGI, Lorenzo**, Italian ecclesiastic: b. Bologna 1472; d. Rome, 25 July 1539. He succeeded his father as professor of law in the University of Padua in 1511, and gained a high reputation. When holding this office he married, and became the father of several children, but having lost his wife, took orders. Pope Julius II made him bishop of Feltri, and Leo X, after giving him a cardinal's hat, employed him on several important missions, the execution of which gave him some prominence in connection with the Reformation. One of his missions was to Germany, for the purpose of regaining Luther; and another to England, to attempt to levy a tithe for defraying the expense of a war against the Turks. He failed signally in both, but ingratiated himself with Henry VIII, and was made bishop of Salisbury and archbishop of Bologna (1524). Under Clement VII he was sent as legate to the Diet of Nuremberg, where he vainly endeavored to unite the princes in opposition to Luther; and to the Diet of Augsburg. He again visited England, with extensive powers to decide in the question of divorce between Henry VIII and Queen Catherine; but his temporizing measures lost him the confidence of all parties, as well as his bishopric of Salisbury. Notwithstanding his repeated failures, he remained high in favor at the papal court. At his death he was archbishop of Sabina. His tomb is in the church of Saint Maria of Trastevere.

CAMPEN. See Kampen.

CAMPEN, Jacob de. See Kampen, Jacob de.

CAMPEN, Jan van. See Kampen, Jan van.

CAMPER, käm'pėr, **Pieter**, Dutch anatomist: b. Leyden, 11 May 1722; d. The Hague, 7 April 1789. He distinguished himself in anatomy, surgery, obstetrics and medical jurisprudence, and also as a writer on æsthetics. From 1750 to 1755 he was professor of medicine at Franeker, and from the latter year to 1763 at Amsterdam. Henceforth till his resignation in 1773 he held a professorship at Groningen. His ‘Dissertation on the Natural Varieties,’ etc., is the first work in which was thrown much light on the varieties of the human species, which the author distinguishes by the shape of the skull. His ‘Treatise on the Natural Difference of Features in Persons of Various Countries and Ages,’ and one on ‘Beauty as Exhibited in Ancient Paintings and Engravings,’ followed by a method of delineating various sorts of heads with accuracy, is intended to prove that the rules laid down by the most celebrated limners and painters are very defective. His general doctrine is, that the difference in form and cast of countenance proceeds from the facial angle. His collected writings were published under the title ‘Œuvres qui ont pour objet l'histoire naturelle, la physiologie et l'anatomie comparée’ (3 vols., Paris 1803).

CAMPERDOWN (Dutch, *Camperduin*), Holland, a stretch of sandy hills or downs in the province of North Holland, between the North Sea and the small village of Camp, off which the British, under Admiral Duncan, gained a hard-won victory over the Dutch, under De Winter, 11 Oct. 1797. For this victory Admiral Duncan was raised to the peerage as Viscount Duncan of Camperdown. His son became Earl of Camperdown, and this title still belongs to a descendant.

CAMPERO, Narciso, nār-thē'sō kām-pā'rō, Bolivian statesman and soldier: b. Tojo (now in Argentina) 1815; d. Bolivia 1896. He studied and traveled in Europe, and on his return entered the Bolivian army, and rose to the rank of brigadier-general. He was Minister of War in 1872. After the overthrow of Hilarion Daza in 1880 he was chosen President of Bolivia. He commanded the combined forces of Peru and Bolivia in Tacna campaign, but was defeated at Tacna, 26 May 1880. Internally, his administration was quiet.

CAMPHAUSEN, kämp'how-zen, **Wilhelm**, a German military painter: b. Düsseldorf, 8 Feb. 1818; d. there, 16 June 1885. He studied under Alfred Rethel and Carl Sohn. His paintings include 'Cromwellian Troopers' (National Gallery, Berlin), 'Duppel after the Assault' (same); 'Charles I at Naseby' (Kunsthalle, Hamburg); 'Tilly at Breitenfeld' (Cologne Museum); 'Napoleon III after Sedan,' and portraits of Emperor William, Bismarck and Wolke. He was at first of the romantic school, and although his best works are historical, they are depicted with fine attention to detail and realism.

CAMPHENE, or **CAMPHINE,** (1) a general name for those terpenes which are solid at ordinary temperatures (see Terpene); (2) a purified form of turpentine, obtained by distilling that substance over quicklime in order to remove the resins that the crude product contains, and widely used as an illuminating oil before petroleum was available.

CAMPHOL, a substance now better known as borneol (q.v.).

CAMPHOR, a white, translucent, crystalline substance occurring in the wood and bark of the camphor laurel (*Camphora officinarium, Cinnamomum camphora,* or *Laurus camphora*), a tree indigenous to Japan and central China, and cultivated in many warm countries. The camphor «gum» is obtained by distilling the leaves, bark and chips of wood with steam, and afterward driving out the water and volatile oils from the distillate with a low degree of heat, and then subliming the gum at 350° F. Purified camphor consists of a clinging mass of tough, colorless, hexagonal crystals which break apart readily, but cannot be reduced to powder except with the addition of a little alcohol — which evaporates spontaneously during the grinding. It has the chemical formula $C_{10}H_{16}O$, melts at 350° F., boils at 500° F., and sublimes to an appreciable extent at practically all temperatures. It has a strong, pleasant, characteristic odor, and a peculiar, cooling, aromatic taste. Its specific gravity is about 0.992, and it dissolves to a slight extent in water, and freely in alcohol or ether. Small shavings of it exhibit lively motions when thrown upon a water-surface that is absolutely free from oily matter. (See Surface Tension). It is familiar about the household, on account of its use for protecting furs and woolens from the attacks of moths and other insects, and in domestic medicine. It is also employed in the manufacture of celluloid and various explosives.

«Synthetic camphor» is the name given to a camphor artificially prepared from turpentine oil. It is identical with natural camphor except that it is optically inactive. The process by which it is made consists of first converting the turpentine into pinene hydrochloride (which is known commercially as «artificial camphor»), and then changing this to camphene by the elimination of the hydrogen chloride. Oxidation of the camphene by any one of several patented processes yields the synthetic camphor.

The name «camphor» has been given to many similar substances of widely different derivation: as peppermint camphor (menthol); cedar camphor (from the oil of juniper); cubeb camphor (from the oil of cubebs); thymol (from the oil of thyme), etc. At one of the government experiment stations in the South a good yield of natural camphor has been secured from young seedlings, mown down like grass at the close of the first season's growth, and distilled in the green state. See Borneol.

CAMPHORIC ACID, an organic substance crystallizing in colorless, needle-like, monoclinic crystals, and obtained by oxidizing camphor by boiling it with concentrated nitric acid, or with an alkaline permanganate. It has the formula $C_{10}H_{16}O_4$, and a specific gravity of 1.19, and melts at about 370° F. It is almost insoluble in cold water, but is soluble in hot water, alcohol and ether. Camphoric acid has a limited use in medicine in the treatment of chronic disorders of the respiratory system.

CAMPHUYSEN, kämp′hoi-zĕn, **Dirck Rafelsz,** Dutch theologian and poet: b. Gorkum 1586; d. Dokkum, 9 July 1627. He lost his parents at an early age, and was left to the care of an elder brother, who, thinking that he observed in Rafelsz an inclination for painting, placed him as a pupil in the studio of the artist, Dirck Govertsz. He soon abandoned art to devote himself to theology, which was the reigning passion of the age. He embraced the doctrines of Arminius, and shared in the persecutions under which Arminianism then suffered; was expelled from the curacy of Vleuten; became a fugitive from village to village, a prey to suffering and privation and found now in writing short poems his only relief and consolation. These are generally upon religious subjects, and are characterized by a remarkable depth of feeling. Recent art criticism has shown that the paintings formerly attributed to him were, in point of fact, by the other Camphuysens, his nephews, R. G. and J. G. Camphuysen, or his son, Govert.

CAMPI, käm′pē, a group of Italian artists who founded what is known in painting as the school of Cremona. Of the four of this name, Giulio, Antonio, Vincenzo and Bernardino, the first and the last are the best known. Giulio (b. probably about 1500 or 1502, d. in 1572), the eldest and the teacher of the others, was influenced by Giulio Romano after 1540, as his paintings of that period plainly show, and acquired from the study of Titian and Pordenone a skill in coloring which gave the school its high place. Bernardino (b. about 1522, d. about 1590 or 1595) was the greatest of the school. He took Romano, Titian and Correggio in succession as his masters. It is important to note that, while the first three — Giulio, Antonio and Vincenzo — were brothers, the common assumption that the fourth, Bernardino, belonged to the same family, is not supported by any positively known facts.

CAMPINAS, kam-pē′nạs, Brazil, town on the Piracicaba River, state of São Paulo, 114 miles by rail from the port of Santos, and 65 miles northwest of São Paulo. It is an important coffee exporting centre, also producing sugar, corn and fruits. The situation of the town is unhealthful. Pop. 34,000.

CAMPION, Edmund, English theologian: b. London, 25 Jan. 1540; d. 1 Dec. 1581. He was educated at Christ's Hospital and Saint John's College, Oxford, and distinguished himself greatly, becoming B.A. in 1561 and M.A. in 1564. Though at first a Roman Catholic he adopted nominally the Reformed faith and took deacon's orders in the Church of England.

When Queen Elizabeth visited Oxford in 1566 he was selected to make the oration before her, as formerly while at school he had been chosen to deliver an oration before Queen Mary on her accession. He went from college to Ireland, and while there wrote the history of that country, a superficial work of no real value, and connected himself with the Roman Catholic Church. His enthusiasm leading him to seek to make proselytes to his new faith, he was seized and imprisoned; but after a short time effected his escape to the Low Countries, and soon after joined the English college of Jesuits at Douay, passed his novitiate as a member of that Society, and became distinguished for his piety and learning. At Rome in 1573 he was admitted a member of the order of Jesuits, after which he resided for a time at Vienna, where he composed a tragedy, which was received with much applause and acted before the Emperor; and at Prague, where he taught rhetoric and philosophy for six years. Sent by Gregory XIII on a mission to England in 1581, he challenged the universities and clergy to dispute with him. His efforts were followed by so large a number of conversions as to disquiet the ministry of Elizabeth; and he was arrested and thrown into the Tower upon a charge of having excited the people to rebellion, and of holding treasonable correspondence with foreign powers. Being tried, he was found guilty, condemned to death for high treason and executed at Tyburn. The insults of the populace attended him to the Tower, where torture was fruitlessly applied to extort from him a confession of treason or a recognition of the supremacy of the English Church, and after his death a fragment of his body was sent to each of the principal towns for exposure. Besides his history of Ireland, he wrote 'Decem Rationes' ('Ten Reasons'), and compiled a 'Universal Chronology,' and collections of his letters and several essays were published after his death. He was beatified by Leo XIII in 1886. His biography has been written by Richard Simpson (London 1867), and a complete list of his works is to be found in De Backer's 'Bibliothèque de la compagnie de Jésus.'

CAMPION, Thomas, English poet: b. London, 12 Feb. 1567; d. London, 1 March 1619. His father died when Campion was nine years of age, and his mother soon after. His stepfather, Augustine Steward, sent him to Cambridge. He had intended studying law at Gray's Inn, but did not practise and was not admitted to the bar. Information concerning the rest of his life is vague. In 1606 he appears as a physician in London, where he remained until his death. He wrote a volume of 'Poems' (1595), being Latin elegies and epigrams. He wrote a masque for the occasion of the marriage of Lord Hayes, and three masques for the court of James I. He published (1610–12) four 'Books of Airs,' containing songs written by himself to airs of his own composition: the first book contains 'Divine and Moral Songs'; the second, 'Light Conceits of Lovers'; the third and fourth are not distinguished by any separate sub-title. In his songs the verse and the music are most happily wedded. While he was very popular in his own day, he soon sank into oblivion. His works are full of freshness and charm. Consult the edition by A. H. Bullen, which excludes 'A New Way'; 'Songs and Masques' (ed. by Bullen, 1903, with an introduction by Janet Dodge); 'Poems' (ed. by Vivian, 1907); 'Complete Works' (ed. by Vivian, Clarendon Press, 1908).

CAMPLI, kăm'plē, Italy, a town in Naples, in the province of Teramo, and five miles north of the town of Teramo. It has a cathedral, three churches, an abbey, several convents, a hospital and a mont-de-piété. Pop. 7,236.

CAMPO BASSO, kăm-pō-băs'sō, **Niccolo** (Conte da), Italian soldier: fl. in the latter half of the 15th century. He had first supported the house of Anjou in the kingdom of Naples, but afterward transferred his services to their opponent, Charles the Bold, Duke of Burgundy. At the siege of Nancy, in 1477, on the approach of a superior force under Ferrand, Duke of Lorraine, to relieve the place, Campo Basso deserted to the enemy immediately before battle. The Burgundians were in consequence defeated, and the Duke himself slain. The treacherous Italian was supposed to be the murderer.

CAMPOFORMIO, Italy, town 66 miles northeast of Venice, famous for the treaty of peace between Austria and France which was signed in its neighborhood, 17 Oct. 1797. Its chief provisions were that Austria should cede the Belgian provinces and Lombardy to France, receiving in compensation the Venetian states.

CAMPO MAJOR, Portugal, city of Alemtejo province, 11 miles northeast of Elvas. Situated at an altitude of nearly 1,000 feet, a meteorological station is maintained here. Wine and woolen goods are manufactured. The town is celebrated in literature and history by Scott's ballad, 'The Bold Dragoon,' depicting an incident of the siege in 1811 during the Peninsular War. Pop. 6,000.

CAMPO SANTO ("holy field"), the name given to a burying-ground in Italy, best known as the appellation of the more remarkable, such as are surrounded with arcades and richly adorned. The most famous Campo Santo is that of Pisa, which dates from the 12th century, and has on its walls frescoes of the 14th century of great interest in the history of art. Among more modern Italian cemeteries, that of Genoa is distinguished for its magnificence.

CAMPO SANTO OF THE DISSENTERS. See Bunhill-Fields.

CAMPOAMOR Y CAMPOOSORIO, kăm-pō-ă-mōr' ē căm-pō-ō-sō'rē-ō, **Ramon de,** Spanish poet: b. Navia, 24 Sept. 1817; d. 11 Feb. 1901. He studied medicine with great enthusiasm and thus got his first love of science which never left him and which continued to influence powerfully all his literary work and, to a certain degree, his political and social writings. But though his love of science remained with him he soon tired of medicine and turned to literature. Realizing that his education was superficial and that he lacked a thorough knowledge of the literature and art of his own and foreign lands, he shut himself up in the public library and went through a self-imposed course of reading intended to help fit him for a literary life. His literary work, which at the beginning was as much journalistic as anything else, early brought him into prominence in political circles and he received one political office after another. When Christina fled from Spain in 1840, Campoamor defended her and ever afterward he continued to show admiration for and devotion to her. Naturally, holding these views, he was a Conservative, views which were somewhat modified in his later days. But to his political views we owe a great deal of his prose work which was looked upon as one of the most powerful influences at work in Spain in the middle of the last century. This political work brought to Campoamor, among other offices, those of governor of Alicante and Valencia and State Counsellor under Alfonso XII (1874). The political views held by him at this period of his life are pretty fully and forcibly expressed in ‹Polémicas con la Democracia,› and other works of a like nature, which present vividly the burning political and social questions of the day. Even his philosophical works, mostly of an eclectic tendency and subjective idealism, are influenced by his political ideas and the struggle in which he was engaged.

Already when scarcely out of his 'teens, Campoamor began to be recognized as a poet of force and futurity, and the Liceo Artistico, of which he was a very active member, published a volume of his poems in 1840 and followed up with his ‹Fabulas› two years later. In the same year a Madrid house published ‹Los ayes del alma›; all of which brought him immediate popularity and gave him an entrée into journalism and literary life. He became an editor on *El Español,* a most valued contributor to *El Heraldo,* one of the strongest and most feared political writers of the day, and one of the most prolific contributors in Spain to magazines, reviews and newspapers. His work was widely copied by the provincial press, so that his name was soon found among the best known in literary circles and by the general public wherever the Spanish language was spoken. With this publicity his popularity as a writer grew with great rapidity. In 1862 he was elected a member of the Spanish Academy. Gradually he grew tired of political controversy and, in his latter days, he devoted his time and energy to work of a strictly literary nature, in which poetry began to take the foremost place.

Juan Valera, the great Spanish critic, has said of Campoamor that love and joy are the characteristics of the first half of his life. This is not altogether true, for the sadness, bitterness, mild cynicism and scepticism of his later writings show through frequently in his earlier work. Yet he is ever the artist and his touch is sure and true. A word painter, he is vivid, passionate, yet ever true to nature. As a poet and thinker, as a molder of new forms of expression and shades of thought, he is in the fore rank of the Spanish poets of the past century. The very faults attributed to him by his severest critics are but the reflection of the age in which he lived and labored; for he is at once realistic, sceptical and spiritual, all in a mild way that conveys the impression that faith and doubt are constantly striving in his soul for the mastery; while all the time we are conscious that he is toying with a constantly intruding paganism. For he is a veritable creature of moods, passing from the highest pinnacle of joy to the lowest depths of despair. As a poet, Campoamor possesses a style characterized by much variety and lending itself to exactness of reasoning and of form of expression, to facility of character painting and naturalness of dialogue. This combined with his power of story construction, his dramatic presentation and his energy and directness of style, rather than his facility of political thought, created for him a place in the field of political controversy.

Campoamor ranks higher as a poet than as a prose writer or philosopher. Among his best known poetical works are ‹Dolores› (1840); ‹Los ayes del alma› (1842); ‹Fabulas› (1842); ‹Ternezas y flores› (1843); ‹Colon› (1851); ‹El Drama Nacional›; ‹Cuentos amorosos›; ‹Pequeños poemas›; ‹Nuevos pequeños poemas› (1887); ‹Dolores y cantares› (1882); ‹Poesías y fábulas›; and ‹Humoradas.› His dramas, which were never successful on the stage, include ‹El honor›; ‹Guerra á la guerra›; ‹El palacio de la verdad›; ‹Dies iræ›; ‹Glorias humanas›; ‹Cuerdos y locos.› His most important prose works are ‹Historia crítica de las Cortes reformadoras›; ‹Filosofía de las leyes›; ‹Las polémicas con la Democracia›; ‹El Personalismo›; ‹Lo Absoluto›; ‹El ideísmo›; ‹Canovas›; ‹La Politica.›

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CAMPOBASSO, Italy, city, capital of Campobasso (formerly Molise) province, on Monteverde in the Apennines, 2,200 feet above sea-level, 170 miles by rail east-southeast of Rome. It is a busy agricultural market centre with long-established manufactures of steel and iron ware, notably cutlery. It has a healthful climate, good educational institutions, a cathedral, and the romantic ruins of a feudal 15th century castle overlook the city. Pop. 17,000.

CAMPOBELLO, New Brunswick, an island, eight miles long, in Passamaquoddy Bay, Charlotte County, situated outside of the Maine boundary, in lat. 44° 57′ N. and long. 66° 55′ W. It is noted as a summer resort. Though copper and lead ores exist, the inhabitants are chiefly engaged in the herring, mackerel and cod fisheries. From 1767 Admiral Owen's family retained it as private possession. It was acquired in 1880 by a group of capitalists from Boston and New York. Pop. 1,230.

CAMPODEA, a wingless insect of the order *Thysanura.* Owing to its very primitive features it has been regarded by Brauer and by Packard as being the form nearest related to the probable ancestor of all insects. It is a little white insect living under stones. The body is long and narrow, each thoracic segment equal in size, the antennæ long and narrow, while the body ends in two very large, slender, many-jointed appendages. It is very agile in its movements and might be mistaken for a young centipede (*Lithobius*). Though allied to the bristle-tail (*Lepisma*) it is still more primitive. The mouth-parts have undergone some degeneration, being partly withdrawn within the head. It has a pair of short vestigial legs on the first abdominal segment. This and other features suggest its origin from some form with several pairs of abdominal appendages, similar to *Scolopendrella*. It is a cosmopolitan, and this, as well as its structure, suggests that it is an ancient form which has persisted to the present time.

CAMPOS, kām′pōs, **Arsenio Martínez de,** Spanish military officer: b. Segovia, Spain, 14 Dec. 1831; d. 3 Sept. 1900. He was graduated at the Military Staff School in Madrid and appointed a lieutenant in the army in 1858; served on the staff of General O'Donnell and became chief of battalion in the Morocco campaign of 1859; was on duty in Cuba with the rank of colonel in 1869–72. Returning to Spain, he became a leader in the restoration of the monarchy (1875). With General Jovellar, he called Alphonso XII to the throne; was made commander-in-chief of the Catalonia district, and crushed Don Carlos at Peña de Plata in 1876. For these services he was promoted captain-general. In 1877 he was appointed commander-in-chief in Cuba, and brought the revolution to a close chiefly by means of concessions which, as Minister of War and Premier in 1879, he endeavored unavailingly to carry out. He was Minister of War in 1881 and 1883, commander of the Army of the North of Spain in 1884–85, president of the Spanish Senate in 1885 and captain-general of New Castile in 1888. In April 1895 he was appointed governor-general and commander-in-chief in Cuba, but in January 1896 was recalled to Spain. He found the insurrection more formidable than he had anticipated, and his failure to pursue a vigorous war policy caused much dissatisfaction in Spain. On his arrival in Madrid he repeated his belief that the trouble in Cuba could only be ended by granting reforms. In 1899 he was, for the third time, president of the Senate. For accounts of his important connection with Cuban affairs, see SPAIN — HISTORY.

CAMPOS, Brazil, city of Rio de Janeiro state, on the Parahyba River, 30 miles from the sea at the head of navigation for small steamers, and 145 miles northeast of Rio de Janeiro city. The trading centre, since its establishment in 1730, of a fertile alluvial sugar-cane growing region, also producing coffee, rice, cotton and tropical fruits, its chief industrial establishments are sugar refineries. Campos is the starting point for several small independent railroad lines and communicates indirectly with Rio de Janeiro by way of Macahe. The city, electrically lighted, has many fine buildings. Pop. of city 22,500; of municipal boundaries 78,000.

CAMPRA, André, French composer: b. Aix, Provence, 4 Dec. 1660; d. Versailles, 29 July 1774. He served as master of the King's chapel, and composed for the Royal Academy of Music. He ranks among the most distinguished composers of operas, his themes being classical love stories, notably ‹Hesione› (1700); ‹Iphigenie en Tauride› (1711); ‹Triomphe de l'Amour›; ‹Les Amours de Mars et de Vénus.›

CAMPULUNG, or **KIMPULUNG,** Rumania, city and summer resort, capital of Museel department, in the Carpathian Mountains, at the head of a glen of the Tirgului River. It is the terminus of a branch railway from Ploesci, exporting the products of its paper mills, operated by river water power. Besides ancient Roman remains there are also an interesting 13th century monastery and a cathedral. Pop. 13,000.

CAMPUS MARTIUS (known also as *Campus*, merely) was a large place in the suburbs of ancient Rome, consisting of the level ground between the Quirinal, Capitoline and Pincian hills and the river Tiber. From the earliest times it seems to have been sacred to the god Mars, from which circumstance it received its name. It was originally set apart for military exercises and contests, as also for the meetings of the comitia by tribes and by centuries. In the later period of the republic, and during the empire, it was a suburban pleasure ground for the Romans, and was laid out with gardens, shady walks, baths, etc. After the time of Julius Cæsar it became crowded with public buildings and monuments. Consult Platner, ‹The Topography and Monuments of Ancient Rome› (pp. 339–92, New York 1911). The district is now called Campo Marzo, in which the greater part of modern Rome lies.

CAMPUS SCELERATUS, a name given to a spot within the walls of Rome, and close by the Porta Collina, where those of the vestal virgins who had transgressed their vows were entombed alive (Liv. viii, 15), from which circumstance it took its name.

CAMUCCINI, kä-moo-chē′nē, **Vincenzo,** Italian historical painter: b. Rome, 21 Feb. 1771; d. there, 2 Oct. 1844. He followed the academic-classical style, and is generally regarded as the most notable successor of Mengs in Rome. Among his best-known works are ‹Death of Cæsar› and ‹Death of Virginia› (originals in Capodimonte at Naples); altar-piece representing the incredulity of Thomas (in Saint Peter's, Rome); portrait of Thorwaldsen, painted in 1808; portrait of Pius VII, painted 1814; portraits of the King and Queen of Naples, painted in 1818; ‹Christ Blessing the Children,› painted for Duke Blacas d'Aulps, 1826; portrait of Pius VIII, now in Cesena, 1829; ‹Virgil Reading Aloud from His Own Poems,› painted for Prince Alexander of Russia, 1839; and ‹Camillus Freeing the Capitol,› painted for the King of Sardinia, 1840.

CAMUS, kä′mü′, **Armand Gaston,** French revolutionist: b. Paris, 2 April 1740; d. 2 Nov. 1804. A zealous and ascetic Jansenist and a master of ecclesiastical law, he was elected advocate-general of the French clergy, and in 1789 member of the States-General by the people of Paris. He now appeared as the resolute foe of the ancient régime, gained possession of and published the so-called ‹Red Book,› with its details of expenditures so disadvantageous to the court and its ministers. While attempting to capture Dumouriez he was himself captured and, after two years in Austria, was exchanged for the daughter of Louis XVI. He was absent in Belgium during the King's trial, but sent his vote for death. He was made member and afterward president of the Council of Five Hundred, but resigned in May 1797 and devoted his time to literature. He was conservator of the national archives, and as such preserved the old documents of the abolished corporations and institutions, and wrote several legal works.

CAMWOOD, BARWOOD, or RINGWOOD, a red dye-wood (*Baphia nitida*) obtained in Brazil and also in Africa of the family *Leguminosæ*. It once was common in the neighborhood of Sierra Leone, and was also found in Tonquin and other parts of Asia. This wood is of a very fine color, and is principally used in turnery for making knife-handles and similar articles. The dye, mordanted with alum and tartar, obtained from it, is brilliant, but not permanent.

CANA OF GALILEE, town in Palestine, at no great distance from Capernaum (or Capharnaum), remarkable chiefly as having been the scene of our Lord's first miracle. It was there that He turned water into wine (John ii, 1). It was also the city of Nathanael and the place where Jesus, having been appealed to by the nobleman from Capernaum on behalf of his dying son, with a word effected the cure. A long-established tradition has identified it with a village bearing the name of Kefr' Kenna, which lies about four miles northeast of Nazareth; but in recent years two other sites have been mentioned by Bible students as possible claimants, namely, Kanet-el-Jehil, about six miles farther north, and Ain Kana, which lies somewhat nearer to Nazareth. It is to be said that Kefr' Kenna is at present a village of about 600 rough and uncivilized inhabitants, but with two churches, one Franciscan, one Greek. At Kanet-el-Jehil there are only ruins. The argument in favor of Ain Kana is purely etymological and is not supported by tradition.

CANAAN, kā'nan, the ancestor of the Canaanites (q.v.). He was the son of Ham and the father of Sidon and Heth (Gen. x, 6ff.) and the brother of Cush, Mizraim and Put. In Rabbinical literature he is the first of the seven sinners who made idols for the heathens (Chronicles of Jerahmeel, p. 167). He was predestined for this and similar sins, as he was born on the Ark, contrary to God's wish that the sexes be separated therein. The curse of Noah (Gen. ix, 18–22) descended on him because of the sin of his father, Ham (Gen. ix, 20–27), which story many biblical scholars believe to have been told at first of Canaan. Probably this conclusion was reached because it was contrary to Jewish sentiment for an innocent man to be punished for the sin of another. The story of the curse was written, according to some, to account for and justify the servile condition of the Canaanites and the Israelitish supremacy.

CANAAN and CANAANITES, geographical and ethnological terms applied to the country and the inhabitants of southern Syria in general. The country extended from the foot of Mount Hermon to the lower end of the Dead Sea, including territory both east and west of the Jordan; that is, Judea, Phœnicia and Philistia proper. Ethnologically the name was applied to all of the heathen peoples (Jebusites, Hittites, Amorites, etc.) whom the Israelites found west of the Jordan. The country is in some instances connected with Phœnicia, and in consequence it appears (e.g., Hos. xii, 8: Is. xxiii, 8) in the general sense of merchant. The geographical inference is that the land was originally a small strip of coast, gradually extended by conquest. The etymology has been derived from the dialectic word meaning "low," because of the fact that in Egyptian the word appears with the article prefixed "the canaan"; but this derivation has been contested, and the suggestion has been made that the land took its name from the people, not vice-versa.

The earliest mention of "Canaan" is found in the Amarna tablets where the name is used interchangeably with "Amurru" for the land subject to the Amorite Aziru (162, 41) (see AMORITE), but mostly as a general nomenclature of Syria. In the Egyptian inscriptions, Canaan (Ka-n'n) is mentioned at the time of Seti I, and within the territory of Phœnicia in the days of Rameses III; and the "land of Canaan" apparently as Philistia in two papyri from the 19th dynasty. Coins from the time of Antiochus IV and his successors bear the legend of "Laodicea, a metropolis in Canaan."

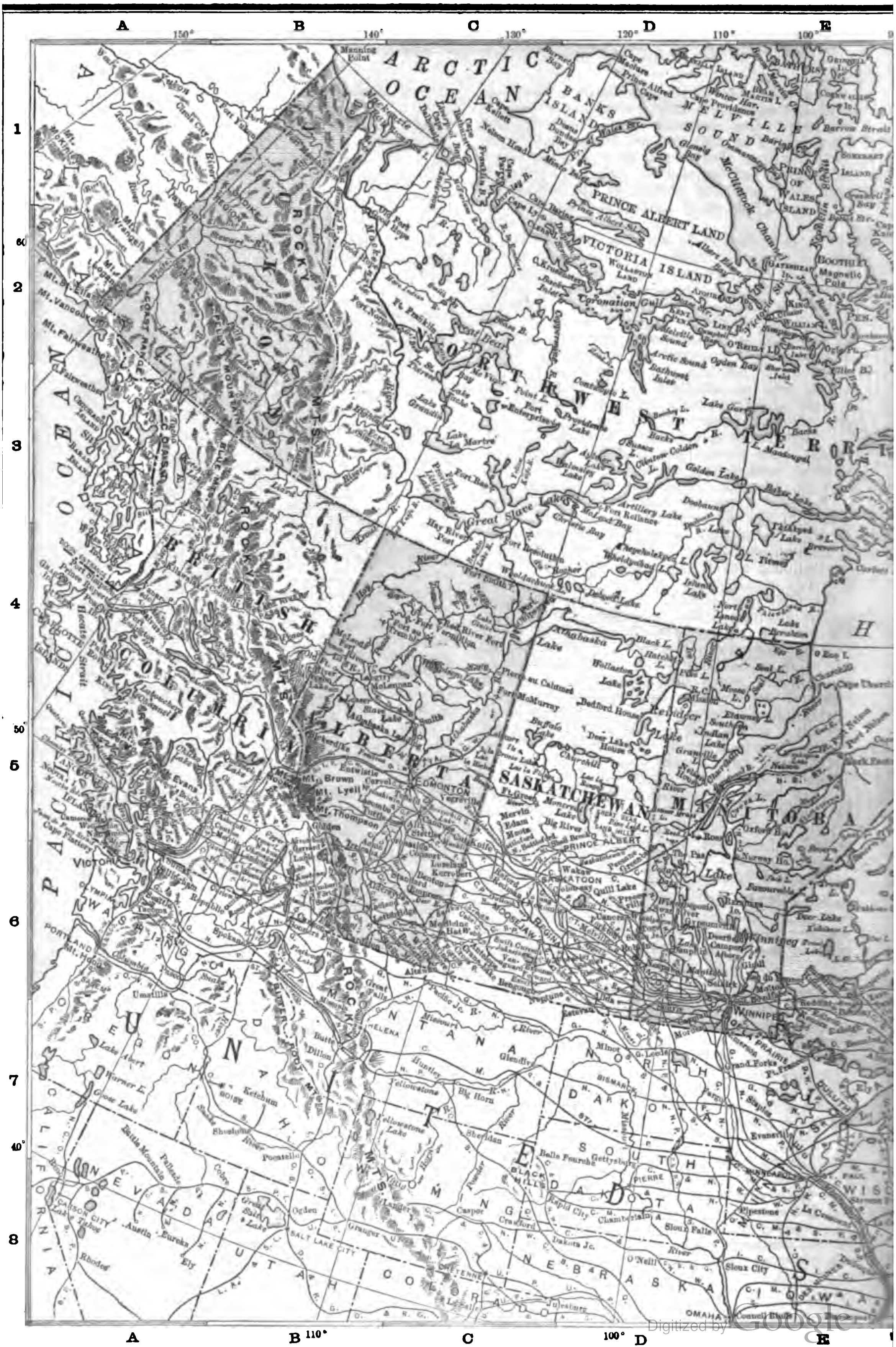
What the original language of the Canaanites was we do not know, but in later times it was understood to mean Hebrew or the closely allied Phœnician dialect.

On the basis of the Egyptian and Assyrian inscriptions the history of Canaan may be divided into three periods: (a) the pre-Israelitish, from about 3800 B.C. down to the definite constitution of Israelitish supremacy; (b) the Israelitish supremacy from about 1100 B.C.—740 B.C.; (c) decline of this supremacy ending in the absorption of Canaan by Assyria and Babylonia 587 B.C. After the return of the Hebrews from the so-called Babylonian exile, the history of the north and south becomes involved in the various attempts to found a world power by Persia, Macedonia and Rome. The characteristic note in the history is the impossibility of political union among the various peoples, probably due to the split-up nature of the coast lands which they inhabited. Consult the 'Tel-Al-Amarna Letters' (ed. by Winckler with trans. 1896); Sellin's report of excavations at Tel Ta'annek; Vincent, 'Canaan' (1907); Benziger, 'Hebräische Archeologie' (1907); Bohl, 'Kanaanäer und Hebräer,' and any of the biblical dictionaries.

CANA-BOTA, a large shark (*Hexanchus* or *Notidanus*) which frequents the waters of the Bay of Biscay and the Mediterranean. Specimens have been found in the waters near the West Indies.

CANACE, kăn'ă-sē, (1) in Greek mythology, a daughter of Æolus and Enarete, who was punished by death because of her unlawful passion for her brother; she is mentioned in Gower's 'Confessio Amantis,' and in Chaucer's 'Man of Law's Tale.' (2) In Chaucer's 'Squire's Tale' the daughter of King Cambuscan, who being the possessor of a magic ring, can understand the love plaint of a female hawk.

CANACHUS, Greek sculptor of the 6th century, B.C. He was a native of Sicyon in Achæa. His most celebrated works were two statues of Apollo, one in bronze executed for the temple of Miletus, the other of cedar-wood for the city of Thebes. Representations of the statue of Miletus have come down to us on the coins of the period.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PRINCE ALBERT LAND
VICTORIA ISLAND
MELVILLE SOUND
PRINCE OF WALES ISLAND
BOOTHIA
Magnetic Pole
Coronation Gulf
YUKON
NORTHWEST TERRITORIES
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
ROCKY MTS.
Great Slave Lake
Athabaska Lake
Reindeer Lake
Manning Point
EDMONTON
PRINCE ALBERT
SASKATOON
REGINA
MOOSE JAW
WINNIPEG
VICTORIA
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SALT LAKE CITY
CARSON CITY
CHEYENNE
OMAHA
Yellowstone Lake
Great Salt Lake
Sioux City
Sioux Falls
Ogden
Butte
Spokane
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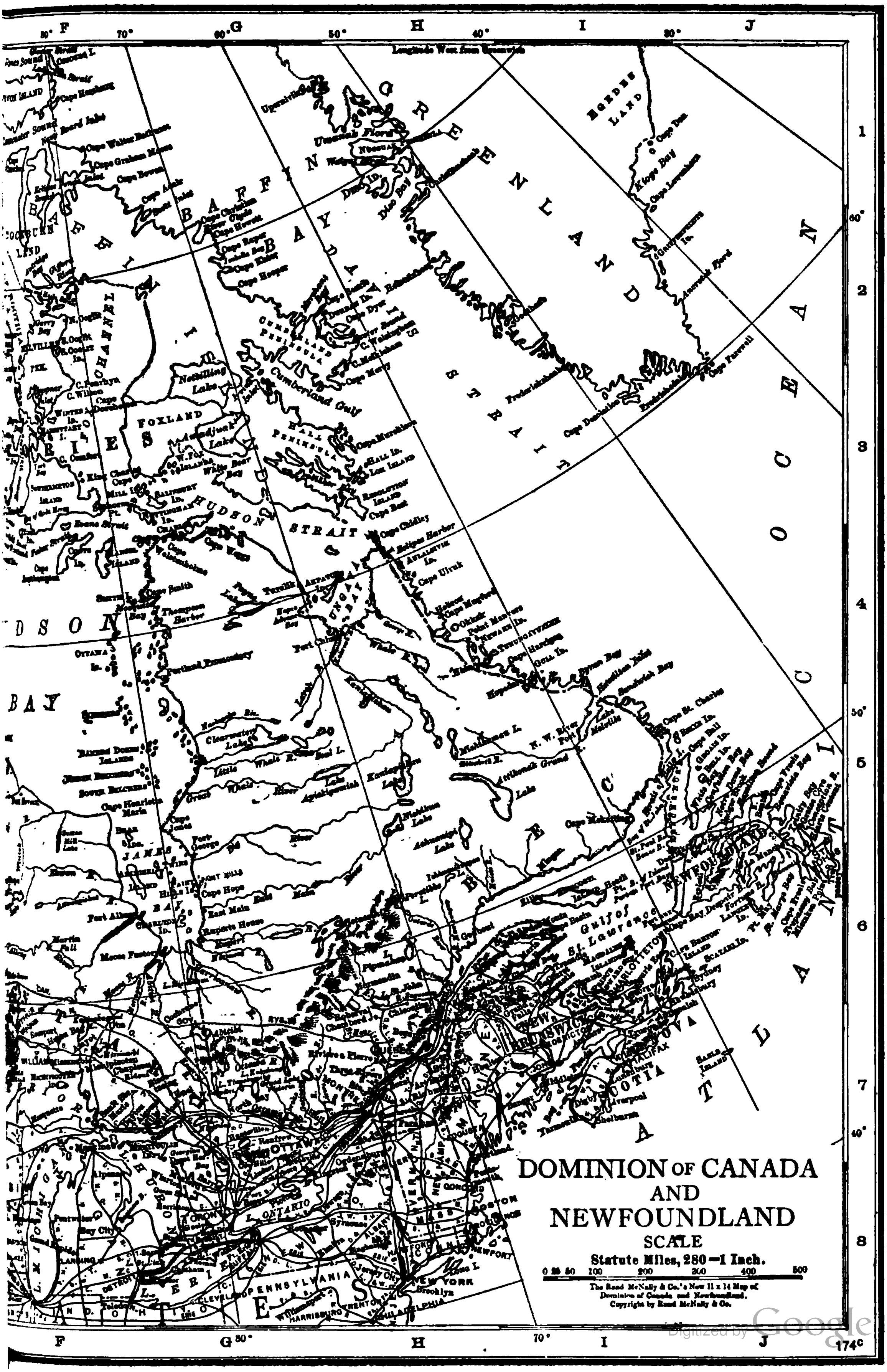
Mt. Lyell
Mt. Thompson
Mt. St. Elias
Mt. Vancouver
Mt. Fairweather



DOMINION OF CANADA AND NEWFOUNDLAND

SCALE

Statute Miles, 280 = 1 Inch.

The Rand McNally & Co.'s New 11 x 14 Map of
Dominion of Canada and Newfoundland.
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CANADA, Dominion of. In the following series of articles will be found a comprehensive treatment of Canada — its history, government, economic development, religious and social activities, etc.

1. Geography
2. Outline History and Political Development
3. The Era of Early Discovery
4. Under the French Rule
5. Great Britain's Fight with France for North America
6. Under British Rule to Confederation
7. The Maritime Provinces to Confederation
8. Confederation
9. Since Confederation
10. The Canadian West
11. The Settlement of the Canadian West
12. The Constitution
13. Local Government
14. Imperial Federation
15. Canada and the European War
15a. Canadion War Economics
16. Diplomatic Relations of the United States with Canada
17. Primary Education
18. Secondary Education
19. Higher Education
20. Public Education
21. Technical Education in Canada
22. Catholic Education
23. Literature
24. Canadian Universities
25. Religious Conditions
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27. The French Canadian
28. Population; Racial Distribution and Immigration
29. Immigration
30. Military System
31. The Acadian Refugees
32. The Quebec Act
33. The Ashburton Treaty
34. Clergy Reserves
35. Seigniorial Tenure
36. Hudson's Bay Company
37. Washington Treaty
38. Jesuit Estates Act
39. Agriculture
40. Forest and Lumber Industry
41. The Grain Trade
42. Minerals
43. Fisheries
44. Manufactures
45. Water Powers
46. Commerce, Tariffs and Transportation
47. Banking System
48. Public Finance
49. Currency, Coinage and Legal Tender
50. The Granger Movement
51. The Labor Movement

1. GEOGRAPHY.

I. GENERAL.—**Area and Boundaries.**— With the exception of Alaska, Greenland, Newfoundland, and the two small islands of Saint Pierre and Miquelon, all the northern half of the North American continent is comprised in the Dominion of Canada. Alaska, the great peninsular projection at the northwest corner of the continent, with a narrow strip of coast depending from it southward, belongs to the United States; Greenland, a huge island at the northeast corner, is Danish; Newfoundland, another island blocking the mouth of the Saint Lawrence estuary on the east coast, is British, and Saint Pierre and Miquelon, lying off Newfoundland, are French. To the north of the continent there is a cluster of large islands, divided from the mainland and from one another by comparatively narrow channels. All of these form part of Canada and are included in its area, but as yet they have been only partially explored, and their exact dimensions are not known. The official estimate, as nearly accurate as it can be made at present, gives the total area of Canada, including the great fresh-water lakes wholly within its boundaries, as 3,729,665 square miles. The boundaries separating Canada from its only continental neighbor, the United States, are to a great extent meridians of longitude or parallels of latitude. Between Canada and Alaska, beginning from the north, the boundary follows long. 141° W. from the Arctic Ocean to Mount Saint Elias, within 20 miles of the Pacific, from which point it is an irregular line running about parallel with the coast round the heads of all bays and inlets of the sea at a distance of 20 to 30 miles inland. It reaches tide-water again at the head of Portland Channel, down which it passes, terminating in the Pacific Ocean. All the islands of the coast south of lat. 54° 40′ belong to Canada as far as the southern extremity of Vancouver Island, except that a cluster of small islands between the southern end of Vancouver Island and the mainland, but south of lat. 49°, are included in the territory of the State of Washington. The international boundary begins again in Juan de Fuca Strait. It takes a devious course from Vancouver Island to lat. 49° on the coast of the continent, and then follows the 49th parallel as far east as Lake of the Woods. A water boundary here begins, up Rainy River and its headwater series of lakes, cutting across the height of land to another chain of small lakes and following Pigeon River to its mouth in Lake Superior. From this point the boundary is the chain of Great Lakes and the Saint Lawrence River to its intersection with lat. 45°. The line now follows a more or less arbitrary course along the 45th parallel for some distance, then rising irregularly to the north almost to lat. 47° 30′, then down the upper course of the Saint John River as far as Grand Falls, then due south to the Saint Croix River, which it follows to the Bay of Fundy. The areas in square miles of the individual provinces and territories since the reallotment of territory in 1912 are as follows:

PROVINCES	Land	Water	Total
Prince Edward Island	2,184	....	2,184
Nova Scotia	21,068	360	21,428
New Brunswick	27,911	74	27,985
Quebec	690,865	15,969	706,834
Ontario	365,880	41,382	407,262
Manitoba	231,926	19,906	251,832
Saskatchewan	243,382	8,318	251,700
Alberta	252,925	2,360	255,285
British Columbia	353,416	2,439	355,855
Yukon District	206,427	649	207,076
Northwest Territories	1,207,926	34,298	1,242,224
Total	3,603,910	125,755	3,729,665

Main Physical Features.— The four principal surface divisions are: (1) The Appalachian region, forming the extreme southeastern corner; (2) the Laurentian plateau or peneplain, with its fringes and outliers of lowlands, comprising the remainder of the eastern half of Canada; (3) the central plain; and (4) the mountain region to the west. Each of these divisions represents, on the whole, a different geological formation and has its own peculiar physical features. I. The Appalachian region of Canada is the northern extremity of the system of parallel ranges of mountains pushed up, as it were, from the southeast against the great archæan, or Laurentian, area. The ranges all run from southwest to northeast, the Nova Scotian peninsular being without a corresponding extension in the United States. The hills are composed of older rocks, rising out of the carboniferous strata which once overlay the whole district, but of later formation than the Laurentian plateau to the north. They are much weathered and the river valleys have been comparatively well eroded. II. The Laurentian plateau or peneplain which covers about half the entire area of Canada is, geologically speaking, the nucleus of the continent. It presents a shield-shaped surface of archæan rocks, broken into on the north by Hudson Bay, and extending south to the Saint Lawrence River

As is implied by calling it a peneplain, it is a much-weathered surface, nowhere rising to any great height, but maintaining a fair elevation above the sea-level, except along the west shore of Hudson Bay. It is a country of hard, crystalline rocks, everywhere scored by glacier action, and sparsely covered with soil in which pine, spruce and other northern trees grow more or less densely, giving place in the higher latitudes to mosses and lichens. As a result of the melting of the glaciers which covered this region in the last geological period, the whole surface is a net-work of small lakes and streams. The latter have been unable to wear down the hard rocks to any appreciable extent, and consequently present all diversities of level with many falls and rapids in their course. The western limit of the plateau is marked by a series of great lakes, from Great Bear Lake in the north to Lake Huron near the southern extremity. Adjoining the Laurentian plateau on the north and south there is, as it were, a fringe of later geological formations. Most of the large islands north of Hudson Bay as of the mainland west of it appear to consist chiefly of older sedimentary rocks in undisturbed arrangement, but the partial glaciation of these islands has hitherto prevented any detailed geological or other survey. South of the Laurentian plateau again occurs a lowland area, consisting of the valley of the Saint Lawrence River and the peninsula enclosed by the three lower members of the chain of great lakes. It is small in extent, but of great importance in the history of Canada, because the first European settlements were established mainly within its limits and it still contains the greater part of the population. III. The central plain is of vast extent, reaching from the Arctic Ocean to the Gulf of Mexico, so that only its northern portion lies in Canada. It is the elevated bed of a carboniferous sea, and from a breadth of 800 miles at the international boundary it is gradually narrowed toward the north by the westerly trend of the Laurentian plateau and broken into by subsidiary ranges of the Rocky Mountains. Still farther north, where it terminates at the Arctic Ocean, it again expands to a width of about 300 miles. There are three steppes of different elevations in this great plain, rising from east to west, and the general slope is from the southwest downward to the east and north. IV. The fourth great region, the mountain belt, is also of vast extent, being traceable in greater or lesser width from the Tierra del Fuego, at the extremity of South America, to the farthest western point of Alaska. In Canada this mountain, or Cordilleran, region attains a breadth of about 400 miles, the greatest average elevation being in the southern portion. The Rocky Mountains, the most easterly range, are paralleled by a succession of smaller ranges, the most westerly of which is represented by the mountains of Vancouver Island and the Queen Charlotte Islands. The geological age of this division is more ancient than that of the central plain, and the changes in the crust have been violent and recent, resulting in the unheaval of the Rocky Mountains, the youngest of the ranges of the Cordilleran System.

Altitudes and Slopes.— The greatest altitudes in Canada are in the Saint Elias range of mountains, a small group near the Alaska frontier, not far from the Pacific Ocean. Mount Logan is the highest of these and is estimated at 19,539 feet. The next greatest elevations are in the southern portion of the Rocky Mountains and the parallel ranges immediately to the west, where several peaks exceed 12,000 feet, although only one, Mount Robson, possibly reaches 13,500. The height of the ranges west of the Rocky Mountains becomes less and less as they approach the Pacific Ocean, and in Vancouver Island the highest peak is under 7,500 feet. The next greatest altitudes are in the extreme east of the Laurentian plateau, in northern Labrador, where a range of hills occurs, bordering on the Atlantic Ocean, which attains a height of 6,000 feet. Elsewhere in Labrador the Laurentian plateau seldom exceeds 1,800 feet, and on the west side of Hudson Bay the Laurentian area is lower and gradually merges in the central plain. The Appalachian region contains ranges of low hills nowhere exceeding 4,000 feet, which is only reached in the extremity of the Gaspé peninsula. The central plain rises in three steppes from the valley of the Red River, about 800 feet above sea-level, to the foothills of the Rocky Mountains, where it has an extreme elevation of 4,200 feet and an average elevation of about 3,000 feet. The Saint Lawrence lowlands are nowhere much higher than 1,000 feet, or about 500 feet above Lakes Huron and Erie, and sink gradually with the Saint Lawrence River to its mouth.

Water Ways.— The distribution of land and water in Canada has rendered the interior continental area peculiarly accessible. The Gulf of Saint Lawrence is a large arm of the sea affording ready means of entrance from the east, and leads to the broad estuary of the Saint Lawrence River. Exploration naturally followed this highway. No mountain barriers occur to obstruct or divert approach by the rivers Saint Lawrence and Ottawa to the chain of great lakes that extend to the very centre of the continent. The length of continuous waterway from the Atlantic Ocean at the Straits of Belle-Isle to the head of Lake Superior is 2,388 miles. Similarly Hudson Bay, a huge landlocked sea, communicating with the Atlantic by Hudson Strait, reaches even farther west than Lake Superior to the south of it. It was by way of Hudson Strait and Hudson Bay that the English explorers arrived at the great interior plains, just as the French *voyageurs* penetrated to the same region by the Saint Lawrence and the Great Lakes. The first systematic attempt at settlement of what is now the province of Manitoba, where the prairies begin, was by way of Hudson Bay, when Lord Selkirk established his colony of Highlanders at the junction of the Assiniboine and Red rivers in the first years of the 19th century. Two great waterways are found in the central area leading up from Hudson Bay and from the Arctic Ocean to the very base of the Rocky Mountains. These are the Nelson-Saskatchewan and the Mackenzie-Athabasaca river systems, both of which were well-traveled highways for *voyageurs* and fur-traders long before settlements along the Saint Lawrence Valley had reached the Ontario peninsula. In the Appalachian region there is one river of considerable length, the Saint John, which flows across the ranges into the Bay of Fundy. The mountain region possesses its great rivers in the Columbia, the Fraser and the Yukon, all of which originate at the western base of the Rocky Mountains and empty into the Pacific. But the rivers of this region are obstructed by numerous and fierce rapids and have not afforded the same facilities for navigation as the rivers of the central and eastern areas. In recent years, however, the Yukon has become a great highway leading to the goldfields of Alaska and the Yukon Territory.

Climate and Vegetable Productions.— The climate of Canada has the usual characteristics of a continental climate in its extremes of heat and cold, but the presence of vast bodies of water, Hudson Bay and the Great Lakes, in the very heart of the continent, has introduced modifications of temperature which differentiate Canada from other great continental areas. Thus, the Laurentian lowlands enjoy a temperate and fairly equable climate, and are wholly free from periods of drought. The central prairies, moreover, though subject to extremes of temperature, obtain sufficient moisture for growing wheat, except in the extreme southwest portion. Here an area of about 20,000 square miles forms part of the semi-arid region which has so great an extension south of the international boundary. The grassy plains are liable to frosts in the early and late summer, perhaps in consequence of the general slope down toward the Arctic Ocean, with no intervening chain of mountains. It has been found, however, that where the ground has been broken up for agriculture over considerable areas these unseasonable frosts do not occur, and at the same time there is a marked tendency to an increase in the average precipitation. The western portion of the central plain enjoys milder winters than the eastern, owing to the phenomenon known as Chinook winds, which cross the mountain ranges from the west and descend upon the plain as warm, dry winds, evaporating moisture and raising the temperature. This contrast is even more marked in the north than in the south of the area. In the mountain region great variations are presented both in temperature and humidity. The islands and the coast of the mainland up to the crest of the first range of mountains upon it have a very mild and very moist climate. The western slopes of the ranges farther inland also receive abundant rainfall and are clothed with dense forests. But the interior plateau receives very little moisture, and its altitude and dryness combine to give it extremes of temperature in summer and winter. The northern part of the Laurentian plateau on either side of Hudson Bay is, for climatic reasons, almost uninhabitable. The forests that clothe the southern portion of the same plateau give place to grasses, sedges and mosses, and ice remains in the rivers and lakes throughout the brief summer. This tundra region, some of which has not yet been explored, covers an area of perhaps 200,000 square miles west of Hudson Bay, where it goes under the name of "the Barren Grounds," and half as much east of Hudson Bay, in the Labrador peninsula. The climate of the Appalachian region is influenced by its proximity to the Atlantic Ocean, and presents no peculiarities. There are three well-defined belts of vegetation in eastern and central Canada. The southern part of the central plain is a region of treeless, grassy prairies, once the home of countless buffalo. In the extreme north, on either side of Hudson Bay are the Arctic tundras, the Barren Grounds, where only mosses and other lower forms of vegetable life can exist, affording food to enormous herds of caribou and a smaller number of musk-oxen. Between these two treeless regions is the great forest belt which covers the whole of eastern Canada and extends across the central plain to the mountains, verging continually north in consequence of the decreasing severity of the winters, until in the valley of the Mackenzie River it reaches beyond the Arctic circle. In the northerly latitudes the forest is composed chiefly of pine, spruces, tamarack and aspen poplar, but in its southern extension, and especially in the Saint Lawrence lowlands and the Appalachian region, deciduous trees, such as the maple, beech and ash, are mingled with the conifers and even replace them in the river valleys. Before the advent of the white men, a dense growth of forest covered the Appalachian region and the Laurentian lowlands, which have since been cleared to a great extent and submitted to agricultural processes. This development is still going on, settlement is pushed farther and farther north, and forest is giving place to farms wherever the soil is suitable. The prairie region is being rapidly converted to agricultural uses, even the semi-arid corner being capable of cultivation by the aid of irrigation. The mountain region, throughout almost its entire extent, is heavily wooded near the coast and on the western slopes of the inland range. The enormous height and girth to which trees of some species, such as the Douglas fir and western cedar, may attain are well known. The river valleys and alluvial flats of the southern portion are suitable for agriculture, but the interior plateau does not receive enough moisture and is given over to ranching.

II. The Provinces.— [For the sake of convenience and completeness, the physical features and topography of the provinces comprising the Dominion are here briefly treated. The articles in this work on the individual provinces should be consulted for further information.]

Nova Scotia.— The province of Nova Scotia, the most southerly member of the Appalachian region in Canada, consists of a peninsula about 250 miles long and 100 at its greatest breadth, and its continuation, the island of Cape Breton, which is separated from Nova Scotia proper by a narrow strait, the Gut of Canso. More or less parallel to the length of the peninsula run ranges of low hills, which near the Atlantic become mere ridges of rock. The country on this, the southern side of the province, is wild and rocky, covered with forests and dotted with small lakes. Agriculture is confined to the alluvial land along the river valleys, and the villages and towns for the most part are situated on the coast at the heads of the numerous bays which here indent it. The north shore of the peninsula is of a totally different aspect. The extended ridge of trap which forms the southern shore of the Bay of Fundy is broken into in a few places only, and long narrow bays are thus formed, into which the tide rushes with great force. The chief agricultural district of the province is behind this protecting wall of trap, and the hills beyond are covered with fertile soil and clothed to their tops with dense hardwood forests. The marshes formed by the enormous tides of Minas Basin and Chignecto Bay, the two heads of the Bay of Fundy, have been reclaimed and diked, and form a rich pasture country. The orchards of the sheltered valleys on this side of the peninsula are celebrated. The chief region of mining and industrial development is the northeast portion, facing Northumberland Strait and the Gulf of Saint Lawrence. Here coal and iron are extensively worked; gypsum also occurs in large quantities and is exported principally from the district around Minas Basin. Gold, on the other hand, is found in the wild rocky region along the southern or Atlantic coast, and is mined on this side from one end of the peninsula to the other. The fisheries of Nova Scotia have always been an important industry, carried on from every harbor of the province. Cape Breton Island, of illegular shape, about 100 miles long by 80 broad, forms part of the province of Nova Scotia. An arm of the sea, entering from the northeast, almost divides the island in two; actual division is accomplished by a canal across the narrow neck of land. A great part of the island to the north is a high forest-covered table-land, and the centre about the Bras d'Or channel is the most picturesque district in the province. At the east side occur the coal and iron ore deposits which are making Sydney, its chief town, one of the industrial centres of Canada.

New Brunswick.— The second in importance of the maritime provinces is New Brunswick, occupying the centre of the Appalachian region of Canada. It forms an irregular square of about 200 miles in extreme length and breadth, bounded on the north by the Bay of Chaleur and the province of Quebec, on the east by the Gulf of Saint Lawrence and Northumberland Strait, on the south by Nova Scotia (at the isthmus) and the Bay of Fundy, and on the west by the State of Maine and the province of Quebec. Two lines of hills traverse the province; one follows the coast-line of the Bay of Fundy, the other, starting from the same southwestern angle, runs diagonally across the province to the northeast. Between the two lies a triangular low-lying plain, sloping down to the east coast, and beyond the diagonal range of hills the northwest region of the province is a rolling country, fertile and well suited for agriculture, but at present covered with forests. New Brunswick is a country of fine rivers, which have cut broad valleys through the soft rocks of the interior and afford access from the sea-coast to the innermost recesses of the province. The Saint John River flows south from the extreme northwest angle, entering the Bay of Fundy not much more than 50 miles from the international boundary. The Saint Croix, forming the boundary, also falls into the Bay of Fundy. The Restigouche, flowing into the Bay of Chaleur, the Miramichi into Miramichi Bay in the Gulf of Saint Lawrence, and the Richibucto, into Northumberland Strait, are the other large rivers. A dense forest, chiefly spruce, still covers most of the province, and lumbering is the principal industry. The fisheries are second in importance. Agriculture follows the river valleys mainly, but the marsh lands at the head of the Bay of Fundy have been converted into rich pastures, and new land in the interior is continually being brought under cultivation. In time, no doubt, the whole of the level area in the centre of the province will be devoted to agriculture, when the forest wealth has been exhausted in that region. The mineral resources of New Brunswick have not yet been developed to any extent.

Prince Edward Island.— Prince Edward Island, the smallest province of the Dominion, is an island in the Gulf of Saint Lawrence, 145 miles long, with an extreme breadth of about 30 miles, separated from New Brunswick and Nova Scotia by Northumberland Strait, which varies from 9 to 30 miles in width. The curving coast on the north side of the island is broken by a deep bay with a narrow entrance, and terminates in long, narrow points. The south coast is very irregular, presenting a succession of bays and inlets. The island has a uniform, gently undulating surface, everywhere fertile, and for the most part cleared of woods and brought under cultivation.

Quebec.— The oldest province, Quebec, formerly a French colony, is still largely inhabited by French-speaking people, although in the extreme south a group of counties, commonly known as the Eastern Townships, were settled almost exclusively by English-speaking colonists. The province of Quebec is the largest in Canada. It now embraces the whole of the Labrador Peninsula except the strip of eastern coast which belongs to Newfoundland. Its western boundary is Hudson Bay, James Bay and a north and south line from near the southern extremity of James Bay to the head of Lake Timiskaming, an expansion of the upper Ottawa River. The southern boundary is irregular, consisting of the Ottawa River nearly to its mouth, then the 45th parallel of latitude, and the rest of the international boundary eastward as far as New Brunswick, and finally the Restigouche River and the Bay of Chaleur separating it from that province. The island of Anticosti and the Magdalen group in the Gulf of Saint Lawrence belong to Quebec. The whole of the valley of the Saint Lawrence River, from a short distance above Montreal, lies within its boundaries and constitutes, with the Eastern townships, the chief agricultural district. The valleys of the principal affluents of the Saint Lawrence are also cultivated, and two new agricultural districts, that watered by the upper Ottawa and the country about Lake Saint John, out of which flows the Saguenay River, are receiving a great influx of settlers. Except for the northern portion of the Labrador peninsula and the area in the extreme northwest of the province, which drains into James Bay, all the rivers empty into the Saint Lawrence River or Gulf. From the north come the Ottawa, the Saint Maurice and the Saguenay, and many others of less note farther east, while from the south the only ones of importance are the Richelieu, flowing from Lake Champlain, and the Saint Charles, emptying nearly opposite the city of Quebec. The general slope of the country is thus apparent. The southern edge of the Laurentian plateau, which runs not far from the Ottawa and Saint Lawrence rivers, comes quite down to the coast of the Gulf. South of the Saint Lawrence River the fertile lowlands are bounded by the ranges of the Appalachian system, which approach ever nearer to the river until, in the Gaspé peninsula, they also reach the water's edge. Next to agriculture the chief industry of the province is lumbering. The immense extent of the forests on the Laurentian plateau provides a source of supply that is virtually inexhaustible, and the recent development of the manufacture of pulpwood has given new value to the smaller and softer trees such as the spruce. The mineral wealth of Quebec is at present undeveloped. Recent geological investigations have proved the existence of copper, platinum and antimony in the southern part of the province. Asbestos of the best quality is found in the southeastern part and virtually constitutes the world's sole supply of the mineral. Mica is also mined.

Ontario.— The province adjoining Quebec on the west, Ontario, is the most populous and wealthy of Canada. It extends from the province of Quebec to Lake of the Woods. It is bounded by the province of Quebec from its southeastern extremity on the Saint Lawrence River to James Bay in the north. Its northern boundary is the waters of James Bay and Hudson Bay. On the west a wholly artificial boundary line separates it from the province of Manitoba, consisting of the boundary of the old province of Manitoba running due north from the Lake of the Woods, and then a line running northeast from the northeasterly corner of the old Manitoba to Hudson Bay where the 89th meridian of west longitude intersects the shore of the Bay. The southern boundary is the international boundary formed by the chain of Great Lakes and the Saint Lawrence River. The whole of the province is thus to the north of the great waterway, but as both the Great Lakes and the Saint Lawrence River in its upper course lie at the very southern limit of the area which they drain, Ontario contains all the tributary rivers of the Saint Lawrence system as far down as the Ottawa River. These, however, are not as numerous as might be expected, for the height of land between the Hudson Bay and Lake Superior slopes runs very near to the lake. Almost all the northern part of the province, therefore, drains into James Bay and Hudson Bay by many rivers of fair size, of which the chief are the Severn, Albany and Moose rivers and their tributaries. The Nipigon, issuing from Lake Nipigon, flows south, exceptionally, into Lake Superior. In the extreme west a corner of the province belongs to the Lake Winnipeg drainage area. There are no ranges of mountains in Ontario. The Laurentian plateau includes the northern half of the province, while the rest is part of the Saint Lawrence lowlands. The lowlands, and especially their western extremity, the peninsula between Lakes Huron, Erie and Ontario, are the chief agricultural district. The peninsula is favored with an excellent climate and soil, and its southern portion is the principal fruit-growing district in Canada, the chief products being peaches, grapes, strawberries and apples. Hops, tobacco and flax are also cultivated successfully in this part of Ontario. The northern part of the province beyond Lakes Huron and Superior has recently begun to be opened up, and its agricultural possibilities are being developed with great rapidity. Lumbering has always been an important industry, but the available timber limits producing pine have begun to show signs of exhaustion. The increasing demand for wood-pulp has however given new value to the great northern belt of forest, which is mainly spruce. Ottawa is the chief centre of the manufacture of lumber; its situation on the Ottawa, the great log-carrier of two provinces, and the magnificent water-power of the Chaudière Falls, utilized for operating the sawmills, give it advantages over all competitors. The mineral resources of Ontario have begun to be turned to account. In the western part of the Ontario peninsula petroleum wells have long been worked but the production is now diminished. The comparatively rare metal, corundum, occurs in southern Ontario. The province ranks third among the silver-producing countries of the world, owing to the recent discoveries in the Cobalt district. Copper is mined in increasing quantities in the Sudbury district, which is also rich in nickel. In production of nickel Ontario now ranks easily first among countries. Iron is found in many different localities but the ore is principally mined in the Algoma district, northeast of Lake Superior. The water-power of the rapids in the Saint Mary River connecting lakes Superior and Huron has been utilized, and great iron and steel manufactures have been established at the town of Sault Ste. Marie.

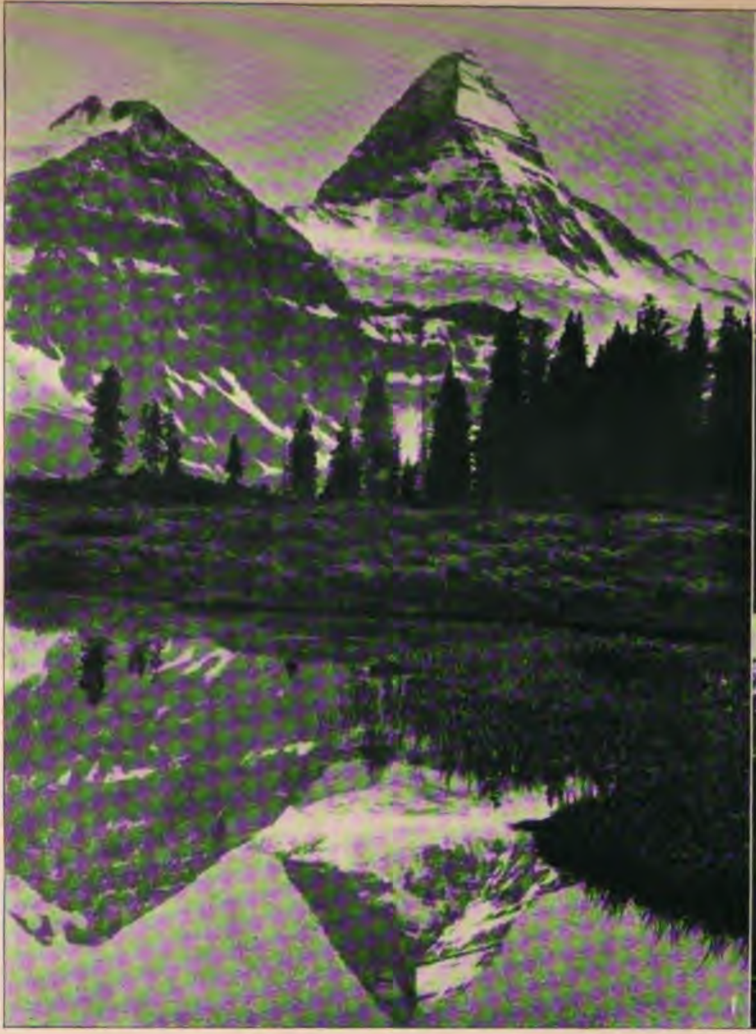
Manitoba.— The next province westward is Manitoba. It extends from the international boundary on the south to Hudson Bay and the 60th parallel of latitude on the north. It is bounded on the east by Ontario and on the west by a line running north and south, coinciding with long. 102° in its northern portion as far as lat. 56°, but from there south trending slightly eastward until it intersects the international boundary in long. 101° 20′. The southern part of the province is one of the chief wheat-growing districts of Canada. It consists of a perfectly level plain, the alluvial bed of a former lake, through which winds the Red River. This first prairie steppe is bounded on the east by the Laurentian plateau which covers all the eastern part of Manitoba beyond Lake Winnipeg. Westward, an escarpment, nowhere rising higher than 500 feet above the level of the first steppe, runs in a northwesterly direction and marks the beginning of the second prairie steppe, which presents a more undulating surface. The area covered by water is considerable. Lake Winnipeg, a very large lake, is within the boundaries of Manitoba, as are also Lake Manitoba and Lake Winnipegosis, with others of smaller size. The chief river of the southern part of the province is the Red River which enters Manitoba from the south and empties into Lake Winnipeg. At Winnipeg the Red River is joined from the west by the Assiniboine, which with its affluents waters all the southwestern part of the province. The northern portion of the province, added in 1912, contains the lower course of the Churchill River and the whole of the Nelson River which flows out of Lake Winnipeg. These are the two largest rivers of the province. The Saskatchewan also, which flows into Lake Winnipeg, and thus may be considered as the upper course of the Nelson River, passes through Manitoba in the latter part of its lower course. The predominating interest of the province is agriculture. The large territory recently added to the area is forested to a considerable extent and may prove to contain valuable minerals. But at present both lumbering and mineral industries in the province are in their infancy.

Saskatchewan.—The province of Saskatchewan, established by Act of Parliament in 1905, is bounded on the south by the international boundary and on the north by the 60th parallel of latitude, and extends from the Manitoba boundary westward as far as the 110th meridian. It is thus a huge rectangle about equally divided between prairie and wooded country, the limit of each lying northwest and southeast across the province. Most of the northeastern half is comprised within the Laurentian area, where the forest is scantier and the trees more stunted than in the belt of woodland contiguous to the prairie section. In the northern portion there are several very large lakes, such as Lake Athabasca, Rein Deer Lake, Wollaston Lake, and the chain of lakes which constitute the head waters and upper course of the Churchill River. The Saskatchewan River flows through the middle region of the province, and the Qu'Appelle River waters the prairie section farther south. The general slope being from west to east, all the rivers flow across the province to the east or northeast, except in the extreme northwest where the slope is north toward Lake Athabasca and the Mackenzie River basin. The prairie section comprises all of the second prairie steppe not included in Manitoba and a portion of the third and highest. The escarpment of the latter runs northwest, appearing from the lower level like a range of low hills. When the crest is reached the third socalled steppe is found to be a much more irregular surface than the rolling plain below. Certain portions of it form small isolated plateaus, standing as high as 2,000 feet above the surrounding country. Saskatchewan is emphatically an agricultural province. The production of wheat is even now more than twice that of Manitoba, and although settlement has been extraordinarily rapid in the southern or prairie part there are still large areas in the central and more wooded portion which are just as well adapted for cultivation of grain or stock raising. Lignite coal is almost the only mineral known and it is mined in the southern part of the province to some extent.

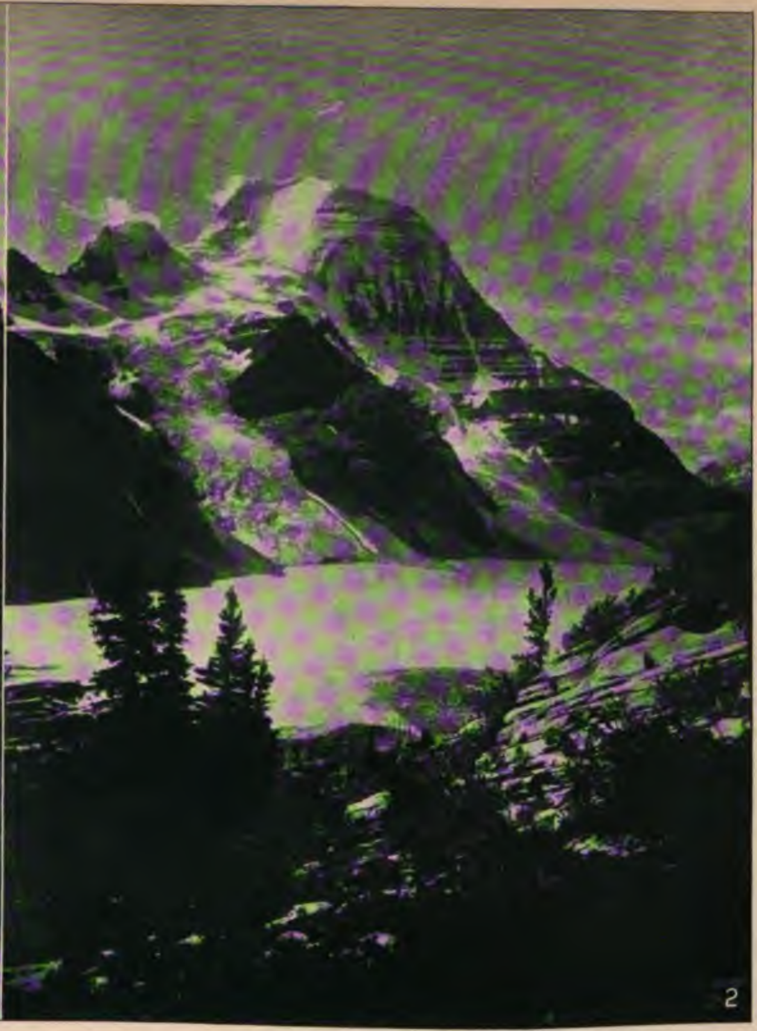
Alberta.—Adjoining Saskatchewan on the west is a second province, Alberta, established by Act of Parliament in 1905. Like Saskatchewan it extends from the international boundary to the 60th parallel of latitude. Its western limit is the summit line of the Rocky Mountains from the international boundary to the point where that line crosses the 120th meridian of longitude, very nearly in lat. 54°, and from this point the 120th meridian to lat. 60°. Alberta, like Saskatchewan, is divided almost equally between prairie in the south and woodland in the north. Its prairie land is altogether within the limits of the third prairie steppe described above; much of it constitutes a semi-arid district, not suitable for agriculture except by the aid of irrigation, but making excellent pasture-land. The extreme northeastern corner of the province touches upon the rocky Laurentian area, but the rest of the northern half of the province is well-wooded country, broken by prairie openings, with abundant streams and small lakes, suitable alike for grazing or crops. The Peace and Athabasca are the main rivers in this half of the province, while the North and South Saskatchewan rivers with numerous small affluents rising amid the mountains and foothills cut their channels deeply into the rolling prairie of the southern portion. The climate of Northern Alberta is much milder than the latitude would indicate, and wheat can be grown successfully in the valley of the Peace River near the northern boundary of the province. Besides agricultural possibilities, there are mineral resources of great value as yet only partially developed. Coal is found throughout a large area, and in various formation, from anthracite to lignite. Bitumen (in the "tar sands" of northern Alberta), oil and natural gas are also important assets.

British Columbia.—British Columbia occupies the whole of the mountain region from the international boundary to lat. 60°. It also cuts off a portion of the central plain, where the eastern boundary of the province leaves the Rocky Mountains and runs north along long. 120°. Vancouver Island and the other islands off the mainland are included in the bounds of the province. West of the broad chain of the Rocky Mountains, which form the eastern boundary, three older ranges run approximately north and south and are thus confined to the southern part of the province, being extinguished northward by the more recent upheaval of the Rockies, whose axis inclines to northwest. These smaller and lower ranges are, in order from east to west the Purcell, the Selkirk and the Columbia systems. Near and parallel to the Pacific coast another broad mountain system, the Coast Range, extends northward into Yukon Territory and Alaska, where it reaches its greatest elevation. Between the Coast and Columbia ranges there is the interior plateau, about 100 miles in breadth and from 2,000 to 3,000 feet in elevation. To the north it is cut off by transverse ranges of mountains. Vancouver Island and the Queen Charlotte islands are the unsubmerged remains of a subsidiary mountain range west of the Coast Range. The rivers and lakes of British Columbia occur in deep valleys between the ranges. The Columbia River and its chief affluent, the Kootenay, take a remarkable course through the valleys between all the eastern ranges, running north and south in great loops. The lake-like expansions of both rivers form the chief navigable inland waters of British Columbia. The Fraser River which rises in the Rocky Mountains flows at first north, but soon turns westward round the head of the Cariboo Mountains, and finally runs almost due south cutting a deep channel in the interior plateau. It breaks through the Coast Range and reaches the sea not far from the international boundary. Its chief affluent is the Thompson. Both are very turbulent streams and form an additional obstacle rather than an assistance to inland communication. The northern half of the province is still very imperfectly explored. In a central elevated plateau many rivers take their rise, some flowing south to join the Fraser, others, such as the Liard, east into the Mackenzie basin, others again like the Skeena and Stikine westward into the Pacific Ocean. What British Columbia lacks in a system of navigable inland waterways is more than made up by its deeply indented coast line, where many magnificent harbors for sea-going vessels of any draught are available, from Port

CANADA



1 Mt. Assiniboine, the Matterhorn of the Canadian Rockies



2 Mt. Robson, the Monarch of the Canadian Rockies

Simpson and Prince Rupert at the north to Burrard Inlet at the south extremity. The coast of Vancouver Island is also well supplied with harbors. British Columbia, although so mountainous, is not without its agricultural industries. The interior plateau forms a good ranching country, and in the sheltered valleys, where irrigation can be introduced, fruit farms are very successful. Lumbering is one of the great industries of the province, and the mineral wealth is very great. Gold has been found in many localities from the international boundary to Atlin district on the borders of Yukon Territory. Placer mining alone has been carried on in most of these places, but in the Kootenay district in the extreme south, where communication by railway and water is easy, scientific treatment of ores has been practised for some years. The metals, besides gold, produced by this method are silver, lead and copper. The exceedingly heavy growth of timber has added to the difficulty of making roads and even of prospecting. The most important mining industry, however, is coal-mining. Vast deposits have been explored and are being worked in various parts of the province, but chiefly on Vancouver Island at Nanaimo and Comox and in the Rocky Mountains at Crow's Nest Pass. Another great industry of British Columbia is the salmon-fishery, which is carried on chiefly at the mouth and in the lower reaches of the Fraser River. Canneries are also established at the mouths of the Naas, Skeena and other rivers.

Yukon.— The Territory of Yukon, under the government of a governor and an executive council, in part elective, lies north of British Columbia and is bounded on the west by Alaska. It has also a northern coast-line on the Arctic Ocean, but a comparatively short one, its eastern boundary being an irregular line sloping from southeast to northwest, for the most part following the easternmost range of the Rockies. It does not lie entirely outside of the Mackenzie river basin, for the mountain boundary is low and the upper waters of many streams tributary to the Liard River, which flows into the Mackenzie River, take their rise in the southeast part of the Territory and flow south. In the north portion also the Peel River, flowing parallel to the Mackenzie, is contained within the boundaries of the Territory for most of its course, but bursts through the mountain barrier near its mouth and empties into the Mackenzie where the delta of the latter begins. The great part of Territory, however, is watered by the Yukon and its tributaries, the Teslin, Lewes, Pelly, Stewart and Klondike rivers, all flowing from southeast or east, and in the northern portion the Porcupine, which begins by flowing northeast as if to join the Mackenzie, but turns sharply and flows due west until it crosses the boundary into Alaska. The mountain system of the Territory is the series of parallel ranges of the Rockies, decreasing in elevation as they run further north and turning eastward into the Alaskan peninsula.

The Northwest Territories.— The remainder of Canada, north of the provinces and east of the Yukon Territory, including the islands in the Arctic Ocean, is broadly described as the Northwest Territories, the former provisional districts of Mackenzie, Keewatin and Franklin having been discontinued. This vast country is under the direct control of the Dominion government. It is very sparsely populated by Indians and Eskimos, together with a few white trappers and traders in the employ of the Hudson's Bay Company, and missionaries. The valley of the Mackenzie River in the west is fertile and covered with trees almost to the very mouth of the river in the Arctic Ocean. The climate in that region is not so severe as the high latitudes would seem to imply; the summers, though short, are hot and the summer days long, and vegetables and some cereals have been raised by Hudson's Bay Company's agents at most of their posts in the district. Coal moreover occurs and also pitch, petroleum and natural gas. The fur trade, which is still a considerable industry, is carried on over the whole area covered by the sub-Arctic forest, and much of this vast northern territory will remain the home of many species of fur-bearing animals as long as that forest remains to shelter them. But the northern portions of the country on each side of Hudson Bay must remain a hunting country only. The Arctic archipelago has at present only a sentimental value, although the whale fishery is important and there are undeveloped salmon and other fisheries along the coasts of potential wealth. The series of daring British explorers who, in their search for a northwest passage, discovered the various islands and claimed them for British territory, are commemorated in the names given to the islands themselves and to the principal bays, straits and headlands. For ordinary purposes and for men of the white race they are utterly uninhabitable.

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2. OUTLINE HISTORY AND POLITICAL DEVELOPMENT (1534 to 1918). When the Dominion of Canada came into existence in 1867 the word "Canada" received a wholly new signification. Its origin is doubtful but it was applied loosely in the early time to the regions occupied by France on the Saint Lawrence, called by the French themselves New France. When in 1763 France surrendered her North American territory to England the term «Canada» was commonly used for the new British dominions. In 1774 these dominions, including part of the Canadian Northwest and what is now the northern tier of western American States, were officially called the «Province of Quebec.» Canada does not appear technically until 1791, when the name was used in a constitution given to Upper and Lower Canada, practically the Quebec and Ontario of the present time. Later these provinces were known as Canada East and Canada West. Not until 1867 did Nova Scotia and New Brunswick become a part of Canada. In considering the history of Canada as we now understand the word, it is important to remember that it includes a separate record of detached provinces, Nova Scotia, New Brunswick, Lower Canada, Upper Canada, etc., until 1867.

In the succeeding articles the epochs in Canadian development are treated in detail. It is sufficient here to outline the chief phases of Canada's history. The first of these, the age of discovery in the 16th and early 17th centuries, has received much attention, but there is still great obscurity as to the range of French effort on the Saint Lawrence. Jacques Cartier (q.v.) and Champlain (q.v.) are the most honored names in this pioneer work. Though few details are known, an extensive fur trade and fishing industry existed in the Saint Lawrence region long before the end of the 16th century. Early in the 17th century French trading companies were fighting for the monopoly of this trade.

The second epoch is that of French colonization and exploration until the final struggle with Britain for the country. When the first pioneer efforts were over France undertook the serious work of colonization, with Quebec as her centre of influence. Her aim was to transplant French social life to North America. Huge grants of land were given to seigniors who were to play the parts of lords in Canada, with vassals looking to them for light and leading and paying rent for the land which they occupied. The system was uncongenial to the new world, but it survived during the whole period of French supremacy and is a picturesque and interesting if not a successful feature of French colonization. See article SEIGNIORIAL TENURE.

The first permanent settlement apart from trading posts occupied only in the summer was at Port Royal, now Annapolis, in Nova Scotia. Here the French planned really to till the soil and develop the country. From the first the colony had a terrible struggle for life. In 1613 the English from Virginia destroyed it and, after it was restored to France in 1632, the adjacent American colonies were always planning to drive out the French. After a chequered history they at last succeeded in 1710, during the reign of Anne, in taking final possession of the fort, and it became Annapolis. The quiet village of the present day was thus the object of strife between two nations for well nigh 100 years.

Samuel de Champlain was one of the pioneers at Port Royal, but in 1608 he turned to the Saint Lawrence and made the beginnings of Quebec, long the centre of political and commercial life in Canada. By instinct Champlain was an explorer. Like others of that and a later time he hoped that the Saint Lawrence would in some way lead to a water route to China. To Lake Huron and Lake Ontario Champlain penetrated, but the obstacles were enormous. The Iroquois Indians were hostile to the French from the first, and it is hardly strange that with their menace added to the natural difficulties Champlain could do but little of lift the veil from the North American interior.

Nor was he left free from European rivals. The English followed the French to the Saint Lawrence. Quebec they attacked and captured in 1629, and over it the English flag floated for three years. When in 1632 France recovered the place the fortunes of Canada were committed to a great commercial company. This company of «One Hundred Associates» was to be lord of the land and to have in its hands the work both of trade and of settlement. In France it had the powerful support of Cardinal Richelieu, but when at Quebec in 1635 Champlain died, New France lost its ablest leader, and the company the most effective exponent of its interests. In the end it failed. Both in India and in America in the 17th century the French commercial companies had no success while their English and Dutch rivals succeeded.

After 1635 Canada was the scene of varied activity. It was an age of religious zeal in Europe, and the Jesuit and other missionaries planned to convert and control the savage native tribes of the country. In what is now northern New York, in Ontario, and in Quebec the missionaries did heroic work. Since the French missionaries were the friends of the Huron tribe, the relentless Iroquois, bent on destroying the Hurons, pursued too, the French. By 1649 the Huron settlements and the French missions were alike destroyed, and the French were driven back for a time to their base at Quebec. They had founded Montreal in 1642, but it was long only a fortified outpost to check the Iroquois.

But missions represent only one, if the dominant, phase of French interest. The great interior exercised all the fascination of the unknown upon the chivalrous minds of the French explorers. Radisson, La Salle, Marquette, Joliet are only the best known of the leaders who penetrated to the interior before 1700. On Lake Huron, Lake Michigan, Lake Superior, on the Mississippi, even in the far west of Canada and the United States the survival of French names to this day bears witness to the activity of these explorers. It was a French Canadian, La Vérendrye, who first advanced so far across the prairie as to justify a belief, still held by many, that he came in sight of the Rocky Mountains. But this was not until 1743, and it now appears likely that he did not advance beyond the Black Hills in South Dakota.

Between missions and discovery the slow and laborious work of colonization was in danger of being forgotten, but there grew up gradually on both sides of the Saint Lawrence and near the mouths of its tributaries, colonies of French farmers. The river was their highway. For protection from the Indians they lived as close together as possible and so they divided the land into long narrow strips with the houses stretching in a line on the river front. To the present day it is the most conspicuous feature of the French Canadian farms. Colonization was slow work. Adventurous Frenchmen preferred the wild life of the forest, and it was so difficult to attract settlers that in 1700 there were hardly more than 6,000 Europeans in the whole of New France. They enjoyed no semblance of political liberty. Between an aggressive church and a governor with the ideals of Louis XIV, the subjection of the French *habitant* is in striking contrast with the liberty of New England. Toward the end of the 17th century New France was committed to a very able Governor, Frontenac (q.v.). He had a definite program. He would curb the Church, which aimed to exclude settlement from the interior so that the missionaries might be alone with and thus continue to control the Indian tribes; he would hold back the English, build a chain of forts from the Saint Lawrence by the Great Lakes and the Ohio to the mouth of the Mississippi to shut them out from the West, and finally drive them into the sea. It was a great plan, but it required resources beyond anything that France could command. In Europe she was fighting William III of England and his allies, and needed all the strength she could muster. So Frontenac died in 1698 with his plans unrealized, but he had done a definite work. The mission stage was ended in New France. Entrenched on the Saint Lawrence and soon on the Mississippi, France was ready to engage in the supreme struggle to make the interior French and to build up a great transatlantic empire for the glory of the French nation.

The next epoch in Canada's history covers the prolonged struggle resulting in the British conquest. Probably impossible of realization in any case, the plan of a French empire in America was ended by Louis XIV's misfortunes in Europe. With a great alliance against him, he was obliged to make the Peace of Utrecht (q.v.) in 1713. In this he surrendered his claims to Hudson Bay, to Newfoundland and to Nova Scotia. This was the beginning of the end. Though in Cape Breton, France built a great fortress, Louisbourg, so as to command the Saint Lawrence, and though she still held the country tributary to Quebec, the odds against her were too great. Walpole managed to keep Great Britain at peace until 1744, but when war then broke out France and England engaged in a final struggle for North America. The Treaty of Aix-La-Chapelle (q.v.), in 1748, did not really bring peace. Both sides were preparing steadily for renewed conflict. On the Ohio, on the Atlantic Coast, on the Great Lakes, on the Saint Lawrence, a deadly conflict went on after 1755, and when on a September day in 1759 Wolfe (q.v.) defeated Montcalm (q.v.) before Quebec, the issue was at last decided. By the Treaty of Paris (q.v.) in 1763, France surrendered her dominion of New France to Great Britain.

The 4th epoch in Canadian history covers British rule from 1763 to the Confederation of the Provinces in 1867. After the conquest in 1763, Canada was for a time governed by the British without creating a special constitution for the country, and not until 1774 did the Quebec Act (q.v.) provide for a permanent system. The Quebec Act played a great part in both American and Canadian history. It set up a despotic system of government, and it aimed to bring the whole western country under this despotic régime at Quebec. While introducing British criminal law in the country, it re-established the French civil law. The seigniors retained their feudal rights, the Church was given legal power to collect the tithe.

In the English colonies the Quebec Act caused discontent. They did not desire despotism as a neighbor, they did not wish to be checked in the West, they disliked the legal establishment of Roman Catholicism, and when the colonies revolted the Quebec Act was one of their grievances. They resolved to attempt the overthrow of British rule in Canada and allied, as they hoped, with the conquered French rising against their new masters they planned to make the revolt continental in character. But in 1775 and 1776 the American army failed to take Quebec; and some of the French showed fight on behalf of Great Britain. Soon the plan to drive the British from Canada was abandoned and the country remained firm in its British allegiance.

Probably with this failure the die was cast finally; it is certainly true that the intervening seven score years have never seen any real prospect of the union of Canada with the United States. When the Loyalists, driven from the United States, found homes in Canada they treasured bitter memories of the revolutionary struggle and rendered the prospect of union even more remote. But once settled in Canada these refugees from the United States demanded the self-government which they had enjoyed at home, and at last in 1791 the British Parliament established Lower Canada and Upper Canada each with a legislature of its own and with some, though not a complete, measure of self-government. In 1812 the United States and Great Britain drifted into war, and the second failure at that time to overthrow British rule in Canada confirmed the results of the defeat before Quebec in 1776.

In 1837 there was armed rebellion in the two Canadas. In Upper Canada the inhabitants claimed the complete control of their own affairs that the Colonial Office in London persistently refused, and to vindicate this demand a few took up arms. In Lower Canada there was a war of races. The French majority demanded that they should dominate in the councils of the country. The English minority, allied usually with the governor, resisted this claim, and at length some of the French also appealed to arms. Each revolt failed completely, but the risings threw into a clear light the causes of discontent in Canada and in time a remedy was furnished.

Lord Durham, an English radical Whig, sent out to rule Canada with despotic authority and to restore order, in a very able report, published in 1839, urged that the English province and the French province should be united under one legislature. This was done. In 1841 Canada received a new constitution, and, joined together for the first time, the people of the two provinces could demand respect and consideration. With more than a million people Canada could no longer be treated as the child of the Colonial Office. After a few doubtful years under the new constitution, the Earl of Elgin, the governor-general sent out from England, definitely, amidst some riotous events in 1849, recognized the supreme authority of the Canadian Parliament in regard to Canadian affairs. Since that time political warfare in Canada has been between Canadian parties and not between Canada and the Colonial Office.

But the union of the two provinces contained nothing of finality. Lord Durham had hoped that the English would dominate the French. Instead the French asserted themselves and, since each province equaled the other in the number of its representatives, the work of government under the party system proved extremely difficult. A better political temper was growing up throughout British North America. Once free to control their own affairs the provinces saw the advantages of union. Their insight was quickened when in 1866 an advantageous Reciprocity Treaty with the United States came to an end, and in self-preservation it became necessary to increase the commercial and political strength of the provinces. With surprising rapidity negotiations were successfully concluded between 1864 and 1866, and in 1867 the Dominion of Canada came into existence.

The events connected with Confederation furnish a distinct epoch in Canadian history. In the next and concluding epoch the various provinces have been welded together until a real national life has appeared. The development of Federal government in Canada presents some interesting contrasts with the Federal system in the United States. Sir John Macdonald (q.v.) aimed to make the Federal power strong, the Provincial power relatively weak, and, since his was the master mind that directed Confederation, the Canadian constitution reflected his views. The powers of the provinces are strictly defined, the undefined residue remaining with the Federal government. Carrying out his views Macdonald frequently tried to curb the provinces, and answering him there was a cry for provincial rights. In spite of Macdonald's desires, development in Canada has been rather in the direction of strengthening the authority of the provinces, but it is still true that a province in Canada falls far short of a State of the Union in political authority. The Federal government can disallow Provincial legislation; it can dismiss a Provincial lieutenant-governor and has done so more than once. But as a result of the experience of half a century, a fairly stable balance between the two jurisdictions has now been reached. During this time a real unity has grown up in Canada, and it makes Canadians, as it long since made Americans, one in sentiment from ocean to ocean. The French-speaking province of Quebec is perhaps a partial exception. But on most great questions of national interest Quebec, too, is at one with the rest of Canada.

Bibliography.— The beginner in Canadian history cannot do better than read A. G. Bradley's little volume called 'Canada' (Home University Library) and also his larger volume, 'Canada in the Twentieth Century,' which describes present-day conditions. He might substitute the more scientific volumes on Canada in Sir Charles Lucas's 'Historical Geography of the British Colonies'; 'Canada under French Rule,' by Sir Charles Lucas; 'Canada under British Rule,' by Professor Egerton; and 'Canada, Geographical,' by J. D. Rogers (Clarendon Press). Professor W. L. Grant's school book, the 'History of Canada,' is the best small textbook (Toronto). Miss Agnes C. Laut's volume 'Canada, the Empire of the North' (Toronto), has imagination and vivacity.

The most exhaustive general work on Canada is 'Canada and Its Provinces' (Toronto), a huge co-operative account of history and resources (22 vols.). Kingsford's 'History of Canada' in 10 volumes (Toronto) is full but lacks method. 'The Chronicles of Canada,' (Glasgow) are 32 small, readable volumes, sold only by subscription; Stephen Leacock has in the series three volumes, 'The Dawn of Canadian History,' an account of early discovery; 'The Mariner of Saint Malo,' a life of the first French discoverer in Canada, Jacques Cartier; and 'Adventures in the Far North,' an account of the attempts to find the Northwest Passage, which includes the tragic story of Sir John Franklin. Other well-known writers, such as Miss Agnes C. Laut, Colonel William Wood, Sir Joseph Pope and Professor C. W. Colby, have volumes in the series, which covers the whole history of Canada. Another series, 'The Makers of Canada' (Toronto) includes biographies of the chief leaders in Canadian history.

For special periods, Biggar's 'Early Trading Companies of New France' (University of Toronto) is a learned account of early discovery. The history of the French régime has been told with great literary charm and ripe scholarship by Francis Parkman (Boston). His volumes can be read with pure enjoyment. 'The Pioneers of France in the Early World' is an account of Cartier, Champlain and other early leaders. 'The Jesuits in North America' describes heroic and tragic missionary labors. 'The Old Régime in Canada' describes the planting in Canada of the French type of society which still endures in the province of Quebec. 'La Salle and the Discovery of the Great West' and 'Frontenac and New France under Louis XIV' describe French efforts and policy in North America at the end of the 17th century, while 'A Half Century of Conflict' (2 vols.), 'Montcalm and Wolfe' (2 vols.) and 'The Conspiracy of Pontiac' (2 vols.) give the story of the final long struggle between France and Britain which in the end brought Canada under the British flag. George M. Wrong's 'Fall of Canada' (Clarendon Press) may be said to supplement Parkman by its full account of the last year of French rule. Wood's 'Fight for Canada' covers the Seven Years' War in Canada.

Of English speaking Canada the story has as yet been less thoroughly told and one or two of the following works are out of print. Bourinot, 'Canada under British Rule' (Cambridge University Press) is a brief outline. Bradley's 'Making of Canada' (Constable) and Lucas's 'History of Canada, 1763-1812,' and his 'The Canadian War of 1812' (Clarendon Press), both cover this history down to 1815 including the War of 1812-15 with the United States. The later period has not yet been covered in a single adequate work and the story must be studied in the lives of the chief actors. The most interesting books are in 'The Chronicles of Canada' such as Wallace's 'The Family Compact', Grant's 'Tribune of Nova Scotia' (Howe), and Sir Joseph Pope's 'Day of Sir

John Macdonald.’ In the ‘Makers of Canada’ there are some excellent lives: Lindsay's ‘William Lyon Mackenzie’ tells the story of the leader of the rebellion of 1837; Shortt's ‘Lord Sydenham,’ an account of the governor of Canada who brought about the Union of 1841; Parkin's ‘Sir John Macdonald,’ a good account of that statesman; and Skellton's ‘Day of Sir Wilfrid Laurier.’ Dent's ‘Story of the Upper Canadian Rebellion’ and his ‘Last Forty Years, Canada since the Union of 1841’ are interesting but now out of print. Boyd's ‘Sir George Etienne Cartier’ (New York)is a very full recent account of the French Canadian leader in the federation movement. Sir Joseph Pope's ‘Life and Times of Sir John Macdonald’ (London, Arnold) and Sir John Willison's ‘Sir Wilfred Laurier and the Liberal Party’ (Toronto, Morang) each in two volumes, are very full and excellent. Siegfried's ‘The Race Question in Canada’ (London) is a penetrating study of French ideals.

The vital phase of the later history of Canada is the expansion of the West. Miss Agnes C. Laut's ‘Conquest of the Great North-West’ (2 vols., Toronto) is a stirring account of the Hudson's Bay Company, and her ‘Vikings of the Pacific’ (New York) is the story of discovery from the Pacific side. Sir William Butler's ‘The Great Lone Land’ and ‘The Wild North Land’ (London) are vivid accounts of life on the prairie before the settlers came in. Burpee's ‘Search for the Western Sea’ (Toronto) is a record of the discovery of the West. Milton and Cheadle's ‘The North-West Passage by Land’ (London) is an equally vivid account of crossing the Rocky Mountains in the sixties and should be supplemented by G. M. Grant's ‘From Ocean to Ocean,’ written 10 years later (Toronto 1873). Hayden's ‘The Riders of the Plains’ (London) describes the work of the mounted police in the West, work that has kept the frontier life of Canada almost free from crime. Laut, ‘The Canadian Commonwealth’ (Indianapolis) is a racy discussion of present day problems. The Constitution of Canada will be found in Egerton, ‘Federations and Unions in the British Empire’ (Clarendon Press).

On Canada's relations with the Empire ‘The British Empire’ (Pollard, editor) and *The Round Table,* a quarterly, should be consulted by serious students. The University of Toronto Library publishes an annual ‘Review of Historical Publications relating to Canada,’ in which all books on Canada are reviewed from year to year (21 vols. up to 1918). Larned's ‘Literature of American History’ (American Library Association) has a good Bibliography of Canada.

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3. THE ERA OF EARLY DISCOVERY.

The early history of Canada from 1497 to 1632 may for the sake of convenience be divided into four periods: (1) The period of the early explorations along the Atlantic seaboard, 1497–1533; (2) the discovery and occupation by the French of the gulf and river Saint Lawrence, 1534–43; (3) the rise of the fur-trade, 1544–1612; and (4) the first permanent colonization, 1613–32.

The Explorations along the Atlantic Seaboard, 1497–1533.— The first European to set foot on British North America after the departure of the Northmen in the 11th century was John Cabot (q.v.) of Bristol. Though born in Genoa, Cabot had removed in 1461 to Venice and by his naturalization in 1476 as a citizen of that republic had been able to trade to the Venetian factories throughout the Levant. When on a voyage to Alexandria for spices he made up his mind to push on to Mecca, then the great mart for the transfer of eastern and western goods. He wished to learn the situation of the region where the spices grew. On questioning on this subject those in charge of the spice-caravans at Mecca, they told him that they received them from other caravans coming from further eastward to whom they had in turn been handed over by others coming from still more remote regions. It seemed clear to Cabot that the spices must grow on the very eastern confines of Asia. In that case would it not be more practical to bring them direct to Europe by sea across the western ocean? With this idea in mind Cabot removed with his family from Venice to London. In England he learned that in the summer of 1480 an attempt had been made by two ships from Bristol to find the island of Brazil to the west of Ireland. Under Cabot's direction fresh efforts were made to find both this island and that of the Seven Cities which should but form stepping-stones on the new route to Asia by the west. All was to no purpose. No islands or land of any sort could be discovered. Suddenly, however, in the summer of 1493 news reached England that another Genoese, Christopher Columbus, had sailed out into the western ocean with three Spanish ships and had succeeded in reaching the Indies. Cabot and his friends were roused to fresh efforts. During Henry VII's visit to Bristol in the winter of 1495–96 Cabot proceeded to set before him the advantages to accrue to England could intercourse be opened between that country and Asia. London would become in a short time a greater emporium for spices than was then Alexandria itself. As a result of this interview letters patent were issued on 5 March 1496, giving Cabot and his sons permission to sail to Asia under the English flag. Armed with these powers Cabot fitted out at Bristol a small vessel called the *Mathew.* Her crew consisted of but 18 men. Owing to various delays they were not able to set sail until Tuesday, 2 May 1497. Rounding Ireland, they first of all headed north and then west. After many weeks of varied winds, land was at length sighted at 5 o'clock on Saturday morning, 24 June. On the 53d day after leaving Bristol they had reached the most easterly point of Cape Breton Island. The royal banner was unfurled and as the ship's boat rounded her keel on the beach, perhaps of Mira Bay, John Cabot stepped ashore and in solemn form took possession of the land in the name of King Henry VII. No inhabitants were seen, but the sailors found snares set for game and a needle for making nets. It was, therefore, judged that the country was inhabited. As the climate was agreeable and the soil fertile, they were of opinion that they had reached that portion of the coast of Asia where grew the spices Cabot had seen at

Mecca. The modern Cape Breton was named «Cape Discovery» and Scatari Island which lies opposite, «Saint John's Island,» as the day was the feast of Saint John the Baptist. Sailing north along Cape Breton Island they gave to Cape Ray the name of «Cape Saint George,» and called Saint Pierre, Miquelon and Langley islands the «Trinity group.» Since their provisions were none too plentiful should the return voyage prove a long one, they spent no time in further exploration and early in July set sail for home from Cape Race which they named «England's Cape.» Favored by the westerly winds of the North Atlantic, they made good progress and on Sunday, 6 August, the *Mathew* dropped anchor once more in Bristol harbor. Cabot hurried to Court and on the following Thursday, 10 August, was given a reward of £10 for his successful discovery. According to Cabot's report he had found some 700 leagues to the west of Ireland the country of the Great Khan. Although silk and brazil-wood grew at the spot where he landed, it was his intention on the next voyage to proceed on down that coast till he reached Cipango, for in his opinion this was the region whence came the spices and precious stones he had seen at Mecca. Henry VII was delighted and granted Cabot a yearly pension of £20. On 3 Feb. 1498 new letters patent were issued authorizing Cabot to prepare a fresh fleet of six vessels. In order to secure skilled seamen and probably also to hear news of what Columbus had done, Cabot about this time made a trip to Lisbon and Seville. In Lisbon he came across a certain João Fernandes, called «Labrador» because he owned land on the island of Terceira. When Cabot informed this man of his discovery, Fernandes in turn told him how he himself had also visited a region to the west of Iceland and north of the point in Asia reached by Cabot. The latter's curiosity was roused. Here was perhaps a shorter way of returning to Asia than by crossing again the dreaded western ocean. On Cabot's return to Bristol with Fernandes, a brief consultation with the merchants of that town who had long traded to Iceland convinced everyone that this was the best route to take. By the beginning of May the two vessels manned by 300 men were in readiness. Since it was known that Cabot was taking the route via Iceland, «in his company sayled also out of Bristowe three or foure small ships fraught with sleight and grosse merchandizes, as course cloth, caps, laces, points and other trifles.» Early in June they reached the east coast of Greenland a little north of Cape Farewell. As Fernandes had already told them of this region they named it the «Labrador's Land.» On coasting north along this desolate shore, they found the ice to grow steadily thicker and heavier and the cold to become more and more intense. It was also noticed that the coast trended continually eastward. Finally on 11 June in lat. 67° 30', the crews mutinied and refused tto proceed further in that direction. Cabot was thereupon obliged to turn his ships about and to head back to the south. On reaching Cape Farewell, they sailed west and explored the southern and also the western coast of Greenland. On meeting with ice again on the west coast they once more headed west until they arrived off the coast of the present Labrador, near the modern Table Hill in 57° 40'. Since they had not penetrated to the bottom of Davis Strait they naturally supposed it was merely a gulf and that this coast was one with the Labrador's Land in the north. Following on down this coast, which in their opinion was that of Asia, they at length reached Cape Race and the region explored in the previous summer. Proceeding on toward the south they coasted the shores of Nova Scotia and New England until they reached the bay of New York. They were now much struck by the distance westward they had come. The east coast of Greenland lies in 43° while the longitude of Sandy Hook is 74°, which is only three quarters of a degree less than that of Cuba. Cabot could well say, therefore, that he had now «sayled in this tracte so farre towarde the weste, that he had the Ilande of Cuba on his left hande in maner in the same degree of longitude.» They continued to coast the shores of New Jersey, Delaware and Maryland as far as the 38° parallel of latitude, at which point the low state of their provisions and the absence of any traces of eastern civilization induced them to come about and head back to Bristol, where they arrived late in the autumn of 1498. The results of this voyage proved such a disappointment that no fresh expedition was dispatched until 1501. Meanwhile João Fernandes returned to Portugal. On the island of Terceira, where he had his home, a Portuguese nobleman named Gasper Corte-Real (q.v.) possessed considerable estates. This nobleman, who was much interested in the discoveries that were then taking place, seems to have put himself in communication with Fernandes. The result was that early in the spring of 1500 Corte-Real applied for and received letters patent empowering him to undertake an expedition to the northwest. Setting sail from Lisbon early in that summer he reached the east coast of Greenland on 8 June. They proceeded to follow it northward until 29 June, when the ice-floes and icebergs in Denmark Strait forced them to head back toward the south. Rounding Cape Farewell they explored the southern and western coasts of Greenland, whence as the season was well advanced they once more returned to Lisbon. In the hope of discovering a region of a less wild and desolate nature, Gasper Corte-Real fitted out a fresh expedition in the spring of 1501. They left Lisbon on 15 May and were nearing Cape Farewell when they came upon a large pack of field-ice, which forced them to alter their course to the northwest. At the end of several weeks they came in sight of the coast of our present Labrador in 58°. Following this mainland toward the south they came upon a band of Nasquapee Indians, who still inhabit Labrador. Thinking they would make good slaves they seized 50 of these natives and stowed them under the hatches. Continuing on down that coast they reached Conception Bay in Newfoundland early in September. It was then decided that the two vessels with the Indians on board should sail from here direct to Portugal while Gasper Corte-Real himself should proceed on down that coast in order to discover its connection with the islands discovered near the equator by Columbus. The two caravels reached Lisbon in safety in the second week in October. Though the account of the discovery of this mainland and the appearance of its inhabitants excited considerable interest, more importance was attached to Gasper Corte-Real's exploration of the region to the south. The autumn passed, however, without anything being seen of him or his vessel. In that summer an English expedition had been dispatched to the same coast by João Fernandes, now a naturalized Englishman, and several other English merchants, but on their return in the autumn with three Indians they reported that they had seen nothing of Gasper Corte-Real. In January 1502 his rights were transferred to his brother Miguel, who left Lisbon on 10 May with three vessels to search for his lost brother.. They reached Newfoundland toward the end of June and on the 24th of that month named the modern Saint John's, "the river Saint John," in commemoration of the feast of Saint John the Baptist. To facilitate the search each ship was ordered to visit a certain portion of the coast and to return to Saint John's by 20 August. Two of the vessels returned at the date fixed but the vessel of Miguel himself was never heard of more. An English expedition also visited the same coast in that year and on 20 September King Henry VII granted a pension of £10 each to two naturalized Portuguese "in consideration of the true service which they have doon unto us to our singler pleasure as Capitaignes into the newe founde lande." No trace had been seen by them, however, of either of the missing Corte-Reals. In the hope of finding some trace of them, King Manoel dispatched two vessels to that coast in the summer of 1503, but neither these vessels nor those which were sent out in that year by the merchants of Bristol saw any trace of them. They were thereupon given up for lost. The rich codfishing on this coast had now become so well known that in 1504 the French and Bretons began to resort thither. Two years later a tax was laid on the cod from these parts taken to Portugal. The French rapidly increased in numbers and in 1512 when the first Spanish expedition to this coast was fitted out the latter got their pilots in Brittany. By 1519 the French fleet numbered 100 sail and included vessels from Dieppe all the way down to Bayonne. In 1520 Alvares Fagundes of Vianna in Portugal explored the region between Saint Pierre and Miquelon and the coast of Nova Scotia. On his return he received a grant of these regions from the King of Portugal. It is possible that a colony was sent thither in 1525. In this same year the Emperor Charles V dispatched Estevan Gomez (q.v.), who had sailed with Magellan, to discover in the north a strait similar to the strait of Magellan in the south. Gomez explored the Bay of Fundy and then followed the coast southwards as far as the West Indies. On his return to La Corunna with a ship-load of Indians he was understood to say he had spices. The excitement was great for it was believed he had reached the Moluccas. Ultimately the mistake, which was due to the similarity of the words for slaves and spices in Spanish, was explained and afforded the Emperor and his court much amusement. In 1527 two English vessels, the *Samson* and the *Mary-of-Gilford,* the latter being a three-masted barque of 250 tons' burden, were sent out to find a northwest passage. On meeting with icebergs at the mouth of Davis Strait they headed south. On 1 July in 52° a storm separated them and the *Samson* was never heard of more. The *Mary-of-Gilford* on reaching Saint John's on 3 August found "eleven saile of Normans and one Brittaine and two Portugall Barkes and all a fishing." Finding no news here of the *Samson,* she continued her course to the south "oftentimes putting her men on land to search the state of those unknowen regions." On one of these occasions the Italian pilot, who may possibly have been Giovanni Verrazano, who had explored this coast for Francis I in 1524, was killed by the Indians. In the middle of November the *Mary-of-Gilford* reached the West Indies. Being refused permission to enter San Domingo, she set sail again for England. In the course of her voyage she had met more than 50 French, Portuguese and Spanish fishing-vessels, which shows the proportions to which the cod-fishing on the Banks had then attained. Each year in fact the numbers increased.

The Discovery and Occupation by the French of the Gulf and River of Saint Lawrence, 1534–43.— Though during the course of the first three decades of the 16th century various English, Portuguese, French and Spanish expeditions had explored the seaboard of eastern North America none of them had penetrated into the interior. The first to do this were the French in 1534. The French fishermen who resorted every summer to that portion of this main coast which was rich in cod had noticed that a bay, called by them the "Bay of Castles" from the formation of the land thereabout, extended so far inland that not one had ever been able to reach the head of it. It was just possible, therefore, that this might be the entrance to a strait similar to that found by Magellan in the south. On this being reported to the authorities at home an expedition was dispatched from Saint Malo in the spring of 1534 under the pilot Jacques Cartier with orders to explore this opening. Cartier reached Bonne Espérance Harbor inside the Strait of Belle Isle (then called the "Bay of Castles") on Wednesday, 10 June. Having discovered on examining the coast beyond this point with the long-boats, that it was completely barren and rocky, sail was made on Monday, 15 June, from Bonne Espérance Harbor in order to explore the land seen to the south. Following this south shore of the Strait of Belle Isle they were led steadily down the west coast of what we now call the island of Newfoundland. Off Saint George's Bay to the north of Cape Ray they had stormy weather for a week, which forced them to beat up and down. On resuming their course southward they fell in with the Bird Rocks, which lie 55 miles north-northwest of Cape Breton Island. The island to the south of these they named "Brion Island" after the Admiral of France. From the currents observed here Cartier surmised that the opening beside Cape Breton Island was a strait and that one could sail from Brion Island directly into the Atlantic. "Should this prove to be the case," added Cartier, "it would mean a great saving both in time and distance should anything of importance be discovered on this voyage." As is well known, this opening, Cabot Strait, is now used quite as much as the Strait of Belle Isle. Leaving

Brion Island on Saturday, 27 June, they crossed over to the Magdalen Islands, of which they coasted the northwestern corner until the following Monday, 29 June, when on the wind veering to the south thev had to set sail toward the west. They were under the impression that these islands formed the main shore on the south side of the gulf, and when on Tuesday morning, 30 June, they reached Cascumpeque Bay in Prince Edward Island, they believed that this latter formed part of the same main shore with the Magdalens. The western end of Northumberland Strait, which separates Prince Edward Island from the mainland, was mistaken for a bay and called «Saint Leonore's Bay» in memory of a Breton bishop whose festival is celebrated on 1 July. Coasting northward along the New Brunswick shore they believed on reaching Chaleur Bay that they had at last found a passage into the South Sea. On Thursday, 9 July, they discovered that it was merely a deep bay; «whereat,» says Cartier, «we were much put out.» On account of the heat experienced there they christened it «the Bay of Heat.» Pursuing their course northward they entered Gaspé Bay, where they were detained for ten days by bad weather. On Friday, 24 July, the day before they set sail, they set up a cross 30 feet high as a landmark and also seized the two sons of an Indian chief who had come down to the sea with his tribe to fish. Rounding the peninsula of Gaspé, they were heading straight for the mouth of the Saint Lawrence, when one of the mirages so common in those parts led them to believe that this passage between Gaspé and Anticosti was merely a land-locked bay. They consequently crossed over and followed the south shore of Anticosti as far as the eastern extremity of that island. Continuing on along the north shore of Anticosti they at length caught sight of the Quebec coast opposite and saw that they were entering a passage which they called «Saint Peter's Strait.» At this point a consultation was held at which it was decided that since there was a great probability of this passage being the one they were in search of, it would be advisable as the season was late to postpone their exploration of it until the following year. They consequently headed east along the north shore of the gulf and were finally brought back to the Strait of Belle Isle or the «Bay of Castles,» whence they had set out. The fishermen's statement had been fully confirmed. This narrow opening had turned out to be a great gulf with probably a second entrance into the Atlantic near Brion Island. There was also a prospect that the opening they had just discovered in the northwest corner of this gulf would yet lead them into the South Sea. Setting sail from Belle Isle on Saturday, 15 August, they reached Saint Malo in safety on Saturday, 5 September. As they were in great hopes that the opening in the northwest corner of this large inland gulf would eventually lead them to the South Sea, a fresh expedition consisting of three vessels was sent out under Cartier in the spring of 1535 in order to explore it. Passing through the Strait of Belle Isle and along the north shore of the gulf they anchored on Monday, 9 August, in a small bay on the Quebec shore, opposite Anticosti. As the following day was the feast of Saint Lawrence, this bay was christened «Saint Lawrence's Bay.» The name afterward spread by mistake to the whole gulf and was finally extended to the river. The two savages who had passed the winter with Cartier in France, now informed him that the land on the south side of this Saint Peter's Strait was an island and that further west he would come to the mouth of a very large river. Where that river rose they did not know. With this information to help him Cartier proceeded through the passage north of Anticosti and passing on up the gulf entered the river Saint Lawrence or as the savages called it the «River of Hochelaga.» On arriving at the mouth of the Saguenay his Indian guides informed him that this river took its name from a kingdom lying toward the northwest which was «rich and wealthy in precious stones.» Pleased with this information Cartier pushed on up the «River of Hochelaga» until he reached a large island which he named the «Island of Orleans» after Francis I's third son, Charles, Duke of Orleans. On the banks of a small stream which here enters the Saint Lawrence stood the home of the two Indians who had passed the winter in France. For this and other reasons Cartier laid up his two largest vessels in this stream and with his third vessel and two long-boats pushed on westward to visit another Indian village called Hochelaga. The shallow water at the head of Lake Saint Peter, which he named the «Lake of Angoulême» after Charles, Duke of Orleans, checked the further progress of the sailing vessel which had to be left behind here. Pushing on in their long-boats they reached the Huron-Iroquois village of Hochelaga on the island of Montreal at the foot of the Lachine rapids on Saturday, 2 October. On the following morning a visit was paid to this village and an ascent was also made of a mountain near at hand which Cartier named «Mount Royal.» From this point they had a magnificent view of the surrounding country. They specially noticed the rapids, which checked further progress westward and heard from the savages that there were more such «falls of water» beyond. Just above the rapids another river entered the main stream. According to the savages this was the best route to the kingdom of Saguenay, whose inhabitants were clothed like the French and had great stores of gold and other precious metals.

Cartier made his way back to his vessels on the Saint Charles and in the course of the winter, during which part of his crew was carried off by scurvy, sought to obtain as much information as possible about this northern Mexico called by the savages the «kingdom of Saguenay.» That King Francis might have as much information as possible on this subject Cartier, on the day he had a large cross erected to mark the French possession of this region, ordered his men to seize the chief of this village and eleven others whom he placed on board his vessels as prisoners. Leaving the Saint Charles with only two of his vessels on Saturday, 6 May, he passed down the south shore of the Saint Lawrence and through the passage to the south of Anticosti Island, which on his first voyage he had mistaken for a bay. From Chaleur Bay he steered for Brion Island and discovered after leaving it that the coast to the south was not the main shore but a group of islands. Heading still to the east he reached

Cape Breton Island and found his conjecture as to the existence of a strait here to be correct. After touching at the islands of Saint Pierre and Miquelon he left one of his long-boats in a small harbor 10 miles north of Cape Race and then on Monday, 9 June, set sail for home. They reached Saint Malo in safety on Sunday, 16 July.

Owing to the wars in which France was then engaged, nothing further was done until the winter of 1540-41, when an expedition was organized to proceed to the conquest of this rich kingdom of Saguenay. While Cartier was to act as pilot, the command of the land forces was given to a Picard nobleman named Roberval, who had distinguished himself in the recent wars. Through a delay about the artillery, the latter was not able to be ready in time, so Cartier set sail from Saint Malo alone with five vessels on Monday, 23 May. They had a bad passage out and having waited some time in Newfoundland for Roberval did not reach the island of Orleans until the end of August. Cartier took up his quarters this time at the river of Cap-Rouge, nine miles above Quebec. A week later he sent back two of his vessels to France «with letters unto the King and to advertise him what had been done and found: and how Monsieur de Roberval was not yet come, and that hee feared that by occasion of contrary winds and tempests he was driven backe againe into France.» Five days later Cartier set off in two long-boats to re-examine the rapids of Hochelaga and find out what arrangements should be made for passing them in the spring with the troops. He was informed by the Indians living alongside the rapids that after passing this one there were several others of the same sort before the Saguenay could be reached. With this information to help him Cartier returned to Cap-Rouge, where he spent the winter. Neither in that autumn nor in the spring of 1542 was anything heard of Roberval. The latter did not set sail from France until the middle of April 1542 and was unable to reach Newfoundland until the first week in June. When at anchor there in the harbor of Saint John's he was much surprised one morning to see Cartier arrive. According to Cartier's account «hee could not with his small company withstand the Savages, which went about dayly to annoy him.» On being commanded, however, by Roberval to return «he and his company, mooved as it seemeth with ambition, because they would have all the glory of the discoverie of those partes themselves, stole privly away the next night and departed home for Brittany.» Roberval was thus obliged toward the end of June to make his way up the Saint Lawrence alone. He took up his quarters in the buildings at Cap-Rouge which Cartier had vacated. On 14 September he sent back to France two ships «to carie newes unto the king and to come backe againe the yeere next ensuing furnished with victuals and other things.» During the course of the winter 50 of his people were carried off by scurvy, so that when he set off early in June 1543 to conquer the kingdom of Saguenay he had only 8 boats and 40 men. The remainder who only numbered 30 were left in charge of the fort. How far up the Saint Lawrence Roberval penetrated we do not know; for no further account of his movements has come down to us. It seems probable, however, that after penetrating a short distance up the Ottawa and finding no trace of gold he returned to Cap-Rouge where he found Cartier, who had been sent out to bring him home. In the course of the autumn the rest of the men returned. On the failure of this expedition becoming generally known a new proverb was coined. When any object in appearance of value was found to be worthless, it was called a «Canadian diamond.»

The Rise of the Fur Trade, 1544-1612.— During the 10 years in which the French had been busy exploring the gulf and river Saint Lawrence and seeking to reach the mysterious kingdom of Saguenay, the number of vessels of various nationalities engaged in the fishing trade along the Atlantic seaboard had been steadily increasing. On his arrival at Saint John's, Newfoundland, on 8 June 1542, Roberval had found «seventeene shippes of fishers,» which were six more than Rut had met there in August 1527. Out of this annual fishing trade, which was carried on along the coast from Belle Isle as far south as Cape Cod, gradually grew the fur trade. The fishermen, when riding at anchor in a bay or inlet, found that the savages of the neighborhood were always ready to part with their furs for a mere trifle. Since these furs sold in Europe for a high price, the practice grew up among the fishermen of bringing out each year a supply of trinkets on purpose to barter for furs. The returns were so good that in process of time some vessels made a specialty of the fur trade. Thus in 1569 we hear of a French vessel from Havre that «had a trade with the people of divers sortes of fine furres.» In 1581 some Saint Malo merchants sent a small barque of 30 tons into the upper Saint Lawrence, and so successful did the voyage prove that in the following year they dispatched a ship of 80 tons. In 1583, in which year the merchants of Saint Malo sent three vessels to the Saint Lawrence, Stephen Bellinger of Rouen «brought home a kynde of muske called castor; divers beastes skynnes, as bevers, otters, martenes, lucernes, seales, buffs, dere skynnes, all dressed and painted on the innerside with divers excellent colours.» In the following year the merchants of Saint Malo brought back with them two savages in order that they should learn French and afterward facilitate more extended trading relations. The result was that in 1585 they sent 10 ships into the Saint Lawrence. In January 1588 two of Cartier's descendants obtained a monopoly of this fur trade, but so great was the outcry raised by the other excluded merchants that in May the monopoly was revoked. The trade continued to remain open like the fishing trade until 1599. In addition to cod, some of the vessels fished for furs, and toward the close of the century there was a great development of the walrus-fishing. In the spring of 1591 the *Bonaventure* of Saint Malo made her way to the Magdalen Islands in the Gulf of Saint Lawrence, where she «slewe and killed to the number of fifteene hundred morses or Sea-oxen,» as the walruses were then called. With the 40 tons of train-oil into which these were boiled down she reached the mouth of the English Channel in safety, but was there captured by an English vessel from Bristol. Relying on the information thus obtained, a vessel was sent thither from Falmouth in 1593, and though she «tooke certaine Sea-oxen,» it was «nothing such numbers as they might have had, if they had come in due season,» for they arrived late in the summer. In the spring of 1594 the *Grace* of Bristol set sail to Anticosti, «being informed that the Whales which are deadly wounded in the grand Bay (the Gulf of Saint Lawrence), and yet escape the fisher for a time, are wont usually to shoot themselves on shore there.» Finding no whales she made her way back to the bay of Placentia in Newfoundland, where she met «fishermen of Saint John de Luz and of Sibiburo [Ciboure] and of Biskay to the number of threescore and odde sayles.» After fishing there for some time she made her way to Ferryland on the east coast, where lay «two and twentie sayles of Englishmen.» In that port she «made up her fishing voyage» and set sail for home. In the summer of 1597 the *Hopewell* of London, of 120 tons, was driven away from the Magdalens by two ships of Saint Malo and two others of Ciboure, which united their forces against her. Meeting with a similar hostile welcome from five French ships in a harbor of Cape Breton Island, she repaired to the port of Sainte Marie in Newfoundland, where she found a vessel from La Rochelle and another from Belle-Isle-en-Terre at the mouth of the Loire. Since this latter hailed from a Catholic part of France it was decided to capture her. «We first,» says the account, «sent our boat aboord the Rocheller to certifie him that we were his friends and to request him not to hinder our fight with the enemy. This message being sent, we made all the haste we could unto the ship of Belle Isle, which first began with us with three great shot, one whereof hit our maintop-saile, but both the other missed us. And we also sent one unto them; then being approached nere unto them ten or twelve of us went in a shallop to enter them. And when we boorded them in our boat, they betooke themselves to their close fights, playing chiefly upon us with shot and pikes out at two ports, between which we entered very dangerously, escaping meere dangers both by shot and pike. Some of our men were wounded, but no great harme was done.» With this prize the *Hopewell* returned to England. In the following year an unsuccessful attempt was made to establish a colony on Sable Island. The Marquis de la Roche had obtained his first letters patent authorizing him to occupy land in the region of Newfoundland in 1577, and in 1578 he had set sail thither with two vessels. The «pinnace,» however, had been obliged to return through «fowell weather,» and, though the larger vessel, after being «well beaten by four English ships which this French ship had thought to have robbed,» had «taken her course for Newfoundland,» we do not know what was done there. It is probable, however, that La Roche merely selected a spot for settlement, since it was not until 1584 that the colonists were embarked. Unfortunately «his greatest ship of 300 tons was caste awaye over against Brouage» on the west coast of France, and so the expedition came to naught. From 1589 to 1596 La Roche was kept a prisoner by the Duc de Mercœur, but on his release he made a fresh attempt to establish a colony. In the summer of 1598 he landed on Sable Island 60 «sturdy male and female beggars,» taken from the prisons of Normandy. On returning thither from the mainland he was blown all the way back to France. No fresh attempt was made to continue his colony, and when the remnant was succored by a fishing vessel in 1603, only 11 persons were still alive. On this failure of La Roche's colony, no sign was left that France claimed the region of the Saint Lawrence as her own. To remedy this state of affairs a monopoly of the fur trade for 10 years was granted in the spring of 1599 to a fur trader of Honfleur, who yearly sent out four vessels to the Saint Lawrence. The condition was that he should people the country each year with 50 colonists. In fulfilment of this agreement, on the conclusion of his annual barter with the Montagnais at Tadoussac in the summer of 1599, he left behind 16 men huddled together for warmth in a small log hut at the mouth of the Saguenay. On the return of the vessels in the following summer, no fresh colonists were landed and only five of the former batch were found alive. These had only saved themselves from perishing by taking refuge among the neighboring Indians. In the meantime the remaining traders, who were well aware that the few colonists taken out were only to throw dust in the eyes of the government, loudly complained against their exclusion from the fur trade. To quiet matters, a commission was appointed in the winter of 1602–03, which recommended the admission of certain Rouen and Saint Malo traders on condition they should bear their share of the cost of colonization. Before, however, more colonists were sent out it was deemed advisable to explore the country in detail in order that the best site available might be chosen for the settlement. This survey was carried out in the summer of 1603 by Samuel de Champlain, an officer of the navy, and Dupont-Gravé, one of the fur traders. The result was that in the spring of 1604 a fresh monopoly for 10 years was given to a company formed by the Sieur de Monts on condition that 60 colonists a year should be taken out. The first settlement was formed in the summer of 1604 on the island of Sainte Croix, in the Bay of Fundy. «The Fort hee [De Monts] seated at the end of the Iland, opposite to the place where he had lodged his Canon, which was wisely considered to the end to command the river up and down. And out of the same Fort was the Switzers lodging, great and large, and other small lodgings, representing as it were a suburb. Some had housed themselves on the firme lande neere the brook. But within the Fort was Monsieur de Monts his lodging made with very faire and artificiall Carpentrie worke, with the Banner of France upon the same. At another part was the store-house wherein consisted the safety and life of everie one, likewise made with faire Carpentry worke and covered with reedes. Right over against the said store-house were the lodgings and houses of these Gentlemen, Monsieur D'Orville, Monsieur Champlain, Monsieur Champdoré and other men of reckoning. Opposite to Monsieur de Monts, his said lodging, there was a galerie covered for to exercise themselves either in play or for the workmen in time of raine. And between the said Forte and the Platforme, where lay the Canon, all was full of gardens whereunto everie one exercised himselfe willingly.» The winter of 1604–05 proved so severe on the exposed island of Sainte Croix, the soil of which turned out to be extremely sandy, that in the following summer the settlement was transported across the Bay of Fundy to the harbor of Port Royal (now Annapolis Basin), where the buildings were put together in the form of a large square. The winter of 1605–06 again proved a hard one, however, and, owing to the late arrival of the company's vessel, not only were all the furs taken by interlopers, but the colonists themselves finally embarked in two small boats in order to find a fishing vessel willing to take them back to France. They fortunately met their own vessel, in which they returned to Port Royal. In the spring of 1607, however, the company's monopoly, which had legally seven years more to run, was suddenly repealed through the intrigues of the Hatters' Corporation of Paris. Nothing remained but to send out a vessel to bring home the colonists at Port Royal, which was done.

On Champlain's recommendation De Monts now turned his attention to the Saint Lawrence. In order that he might retrieve a part, at least, of his losses, King Henry IV allowed him a monopoly of the fur trade there for one year. In the summer of 1608, accordingly, Champlain repaired to that part of the river called Quebec, or «the Narrows,» where he constructed a trading-post. It was hoped that this would not only give them an advantage over the other competitors in the years of open trade, but would also hold the warlike nation of the Iroquois in check and allow the Algonquins, who came down every summer with furs from the upper Ottawa, to go backward and forward on the Saint Lawrence in all security. When Henry IV heard of the construction of De Monts' post at Quebec he renewed his monopoly for another year. Taking advantage of this, Champlain, in the summer of 1609, accompanied the Montagnais and the Algonquins on the warpath against the Iroquois. In order to see the palefaces of which they had heard so much, and also to have their share of the victory over the Iroquois, the Hurons, who dwelt beyond the Algonquins on the shores of Georgian Bay, came down to Quebec, for the first time, in the summer of 1609. This combined expedition surprised a combined force of 200 Iroquois on Lake Champlain. At the sight of the French and the report of their firearms the enemy broke and fled. The Hurons were delighted, and promised to come down henceforward every summer to the annual barter. In this same year (1609) the Sieur de Poutrincourt (see BIENCOURT DE POUTRINCOURT, JEAN) established himself with his family in the buildings formerly occupied by De Monts' colony at Port Royal. He continued to reside here until his home was burned by the English in 1613. Although during the winter of 1609–10 De Monts sought to have his monopoly renewed, or at any rate the trade reserved to him, in the region explored by Champlain in his expedition against the Iroquois, all was to no purpose. In the summer of 1610 the fur trade was thrown open to the merchant marine of France to the same extent as the cod, whale and walrus fishing. The result was that so many traders resorted to the Saint Lawrence in that summer that there was a plethora of goods and many ships found it impossible to get rid of even a portion of their cargoes. There was a similar inroad in the summer of 1611. The results of this competition were soon apparent among the savages. Not only did they ask more for their furs, but they also began to have a poor opinion of the palefaces, whom they saw even strip blood-stained furs off the corpses of dead Indians. De Monts also felt it to be unjust that he should be put to the expense of keeping up the post at Quebec when no advantages were accorded him in return. During the summer of 1612 Champlain was kept in France by a fall from a horse, and he improved the opportunity by seeking to bring about a better order of things in the Saint Lawrence. Through his efforts the system of open trade was brought to an end in the autumn of 1612.

The First Permanent Colonization, 1613–32.— In order that the licentiousness of a few merchants should not spoil the trade in the upper Saint Lawrence and ruin the prospects of exploring, with the help of these Indians, the regions farther to the west, Champlain induced the King's uncle, the Comte de Soissons, to apply in the autumn of 1612 for a monopoly of the fur trade above Quebec. This was granted on condition that, during the 12 years it lasted, six families a year should be taken out by the company. Although Soissons died a few weeks later, the monopoly was transferred, at Champlain's request, to Soisson's nephew, the young Prince de Condé. As no time was left to form the company before the trading season opened, Condé merely issued licenses to seven merchants to barter above Quebec. They were each to place four men at Champlain's disposal in case he had need of them. On account, however, of the licentiousness of some of the traders in the previous summer when Champlain was absent, neither the Algonquins nor the Hurons put in an appearance in 1613 at the rapids. At this Champlain set off up the Ottawa with a few attendants, and by his exertions induced over 80 canoes to come down to the barter. In the same summer of 1613 an English vessel from Virginia destroyed De Poutrincourt's home at Port Royal, and also captured a French vessel sent out by the Jesuits to form a colony at Mount Desert, on the New England coast. In the summer of 1614 Champlain completed the formation of the new company for trade in the Saint Lawrence. On the failure of the La Rochelle merchants to appear, the whole of the shares were divided among the traders of Rouen and Saint Malo. On reaching the annual barter at the Lachine Rapid in the spring of 1615, Champlain found that his absence in the previous summer had made the Indians doubt his friendship. In order to regain their confidence, and also explore the regions farther to the west, he set out with the Hurons on their return. He was thus able during the winter of 1615–16 to learn much of the geography of the present western Ontario as well as the region about Lake Ontario, to the southern shore of which he accompanied a war expedition against the Iroquois. So grateful were the Hurons for the help thus accorded them that they accompanied Champlain in great numbers on his return to the Saint Lawrence in the spring of 1616. For this reason, also, the barters of 1617 and 1618 were extremely well attended. Notwithstanding this increase of trade, the company unfortunately did nothing toward establishing a local source of supply, and paid almost no attention to colonization. Only one family was brought out, and it was treated in an extremely unjust manner. Not only were none of its members allowed to engage in the fur trade, but while paying very high prices for all the stores bought from the company they were obliged to sell their own produce at the very low prices current in France. When Champlain, as the representative of the viceroy, sought to secure the fulfilment of these conditions as to colonists, defense and local sources of supply, he simply made himself disliked. In the spring of 1619 they even refused him a passage to Quebec. At the King's express command he returned there in 1620, only to find the factory so tumble-down that the rain came in on every side. When this was notified to the admiral of France, who had succeeded Condé as viceroy, he at once revoked the monopoly of the company and gave the trade to two Huguenot merchants, William and Emery de Caën. The old company, however, appealed to the King. Pending his decision both parties sent out vessels in the summer of 1621 and each left servants of its own to winter at the factory. In the course of the winter of 1621—22 the two companies amalgamated with a fresh monopoly which was to run until the year 1635. Unfortunately this united company neglected colonization and local sources of supply as much as its predecessor. The result was that in the spring of 1623 when the vessels arrived late they found that for some months all the inmates of the factory had been living on roots and berries. The same state of affairs reoccurred a few years later. Champlain, who was still governor, did his best to keep this united company up to its engagements, but whenever he returned to France everything was allowed to go to ruin. Although on his departure in the autumn of 1624 he left the new factory almost completed, he found on his return two years later that not a single nail had been driven in since he went away. «It could have been finished,» said Champlain, «in a fortnight, had they been willing to work, but that is just what they will not do.» As little attention was paid to cultivating a local source of supply, and when, in the summer of 1627, the principal supply-ship failed to appear, the outlook for the winter was far from bright. To make matters worse, war broke out between England and France in the spring of 1628 and several English ships were sent into the Saint Lawrence. Although Champlain bravely refused to surrender the factory, the fleet sent out to Quebec by a new company which Richelieu had formed was captured below Tadoussac. At the same time a Scottish colony was founded at De Poutrincourt's old quarters at Port Royal. In the winter of 1628–29 these Scottish and English merchants formed themselves into one company and sent out two fleets in the spring of 1629. While one brought fresh stores to Port Royal, the other entered the Saint Lawrence and summoned the factory at Quebec to surrender. As no help of any sort had come since 1627 and all the inmates had been living for some time on roots and berries, Champlain was obliged to comply. On 22 July 1629 the English flag was run up on the flagstaff. The new company formed by Richelieu, called the Company of New France, also sent out a fleet, however, which not only succored the small French post at Cape Sable, below Port Royal, but also succeeded in dislodging Lord Ochiltree, who had formed a settlement on Cape Breton Island. He and his people were taken prisoners, and out of the material of their buildings a new French fort was constructed in one of the neighboring harbors. Here a garrison of 40 men was left. In the autumn of 1629 the French applied for the restitution of Quebec, since it had been surrendered after the conclusion of peace on 29 April. King Charles I acquiesced, but the negotiations dragged on until the spring of 1632. In the meanwhile both companies sent out provisions to their posts; the Company of New France to Cape Sable and Cape Breton Island, and the English and Scottish company to Port Royal and Quebec. Finally, on the conclusion of the Treaty of Saint-Germain-en-Laye on 20 March 1632, the post at Port Royal was made over to the Company of New France, while the old United Company was allowed to enjoy the trade at Quebec for one year in order to recuperate itself for its heavy losses. In the summer of 1633 its servants retired and the whole of New France passed into the hands of the Company of New France, which held it until the year 1664.

H. P. Biggar,

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4. UNDER FRENCH RULE (1632-1755).

When the Treaty of Saint Germain-en-laye (1632) restored to France (see France — *History*), her possessions in North America, Acadia and Canada were still savage wastes. Prior to this date Port Royal and Quebec had hardly advanced beyond the status of convenient landing points, while Tadoussac and Three Rivers were mere rendezvous for barter. In theory the profits of the fur trade were enormous, but disaster or disappointment seemed to follow each venture with dismal regularity. At the same time the attempt to establish permanent colonies had been attended by only a moderate degree of success. Louis Hébert and a few other settlers had maintained themselves at Quebec for 21 years before the surrender of that place to the English, but their privations were constant and severe. Those who supported themselves by agriculture were less than a score and the total population barely passed 100. As for the missionary efforts, which constituted a third form of French activity in Canada, neither Jesuits nor Récollets had gained more than a handful of converts and a certain amount of friction between the two orders already existed. One hopeful sign was indeed visible, for in 1627 the Company of New France took form with Richelieu (q.v.) and other prominent people at its head, but this organization (better known as the Company of the Hundred Associates) was just beginning to show signs of vitality when Quebec fell (1629) into the hands of Kirke (see Kirke, Sir David). The general state of the situation can be described in a single phrase. Though individuals had displayed great enterprise and splendid heroism, the French as a nation had not impressed themselves deeply upon the western hemisphere.

Between the Treaty of Saint Germain-en-Laye and Wolfe's decisive victory over Montcalm (1759) (see COLONIAL WARS IN AMERICA) lies a period of 127 years which is marked by all the features of genuine colonization. It cannot be said that in wealth and population New France kept pace with the English colonies from Massachusetts to Georgia: but while the economic basis of the French was less solid their geographical range was wider and their institutions were equally distinctive. For a century and a quarter France continued to be an active competitor for the control of this continent and maintained a strong foothold upon it. Moreover the Canadian French, the *habitants*, developed feelings of local pride and patriotism which, though they did not beget political restlessness, are not less noticeable to the historian than are the pride and patriotism of the English in America. From 1632 to 1759 New France was a colony peopled by vigorous and resourceful inhabitants. Unfortunately it possessed a defective system of administration, but its annals are adorned by noble deeds and its life represents a characteristic form of civilization.

Of the two regions which France regained in 1632, Canada was destined to be the more important and to be held upon the firmer tenure. Acadia with its long frontier of seaboard lay open to easy attack from the side of New England and after 1621, when James I gave Sir William Alexander the charter of Nova Scotia (see NOVA SCOTIA — *History*) its population contained a Scottish element. At the moment when Port Royal fell to the English for the second time (1628) the ablest and most loyal Frenchman in Acadia was Charles de la Tour, but on the formal restoration of the colony four years later Isaac de Razilly, a relative of Richelieu, was appointed royal lieutenant. During his lifetime the French in Acadia proved able to hold their own against New England and even to destroy posts which the English had established on the coast of Maine. De Razilly's death, however, precipitated an acute quarrel between de la Tour and the able, unscrupulous Charnisay, who had come to the colony with de Razilly in 1632. The prosecution of the feud between these rivals led, among other things, to a famous siege of Fort Saint John by Charnisay and a spirited but fruitless defense of the stronghold by Mme. de la Tour in her husband's absence. The long and bitter broil ended peacefully enough in the marriage of de la Tour and Mme. Charnisay after the death of Charnisay and Mme. de la Tour, but meanwhile the prosperity of Acadia had been seriously hampered by a domestic feud which unsettled the whole administrative system and raised the issue of Catholic versus Huguenot. In 1654 Acadia was seized by the English for the third time and held till 1667, when France regained it by the Treaty of Breda (see BREDA, TREATY OF). During the greater part of the next 20 years peace between the two nations prevailed along the Atlantic coast, broken by occasional bickerings at points near a frontier which was always in dispute; but with the renewal of hostilities in the reign of William III Acadia suffered severely and had not repaired her losses when the war of the Spanish Succession (see SUCCESSION WARS) broke out. This time the contest for supremacy reached a final settlement in one part at least of the New World. Nicholson's occupation of Port Royal (which he rechristened Annapolis, 1709) together with Marlborough's victories in Europe combined to secure Acadia to England by the Peace of Utrecht (1713) (see UTRECHT, PEACE OF). But even then the triumph of the English was not complete, for the island of Cape Breton still remained in the hands of France and the guns of Louisburg, guarding the entry to the Gulf of Saint Lawrence, declared more plainly than words that the Atlantic seaboard would not be surrendered to England without a further struggle. In marked contrast to their precarious hold upon Acadia, the French built up along the shores of the Saint Lawrence a colony which, whatever its shortcomings, did not change hands with every generation. Canada was far from invulnerable, as the capture of Quebec by Kirke had already proved and as its siege by Phips (see PHIPS, SIR WILLIAM) was to prove once more in 1690; but long stretches of wilderness separated it from the English settlements, while the navigation of the river presented grave dangers to a hostile fleet. The fate of Sir Hoveden Walker, whose powerful fleet was shattered among the shoals of the Egg Islands (1710), shows that sea power could not be brought to bear against Canada so readily as against Acadia, and the fierce raids of Frontenac illustrate with equal force the ability of the French to defend themselves by land. French rule in Canada lasted long enough and was sufficiently secure to furnish a great object lesson in colonial method.

Apart from military history and the pathos which belongs to the loss of an empire, the life of New France is more interesting in the 17th than in the 18th century. The two generations that elapse between the return of Champlain (q.v.) and the death of Frontenac (q.v.) (1633–98) are marked by a series of striking exploits and the establishment of fixed institutions. Energy and enthusiasm abound; the explorer and the missionary are lavishing their lives on causes which mean infinitely more to them than any form of personal ambition; the colonist is becoming a native, a *habitant*, whose concerns are increasingly associated with America; problems of Church and state are arising to vex the souls of governors and quicken the zeal of prelates. On every side there are signs of that fresh vigor which derives its impulse from the novelty and charm of the wilderness. In dealing with the progress of Canada during the middle and latter part of the 17th century it is necessary to distinguish between the regions which were claimed by right of discovery and those which were effectively occupied by settlement. Before Frontenac's death lands had been cleared and rendered fit for cultivation at a good many points between Tadoussac, where the Saguenay enters the Saint Lawrence, and Montreal. Above Lake Saint Louis there were forts at important strategic points like Kingston (then Fort Frontenac) and Detroit, but for agricultural purposes the colonial zone stopped at the Lake of Two Mountains, an expansion of the Ottawa. Beyond the island of Montreal lay the *pays d'en haut*, a vast territory which was repeatedly traversed by the pioneers, whether adventurers, traders or missionaries, but which remained almost destitute of settlers. From the Saint Lawrence the French were led inevitably to the Great Lakes and thence by an easy passage to the Mississippi. Thus their explorations belong no less to the history of Illinois, Michigan and Wisconsin than to that of Canada. In the Laurentian Valley the river was another Nile with a further element added, since besides being the great local thoroughfare it was a highway that opened the route to the mother country. If, unlike the Nile, its waters could not be made to produce a rice crop, they abounded in the fish which were so necessary to the food of a Catholic community. The form of land allotment sprang from the one cardinal condition of life on the banks of a central stream. Each peasant had his strip of water frontage, however narrow, and was able at a moment's notice to embark in his own bateau or canoe. The only towns of Canada were Quebec, Three Rivers and Montreal, all situated on the Saint Lawrence, and no permanent settlements were made in any part of the country unless within easy reach of it or its tributaries. The north shore, owing to its rugged character, was less suited to farming than the south, and in the valley of the Richelieu, the outlet of Lake Champlain, many of the best seigneuries sprang up. The settlement of the Richelieu Valley was also intended to provide a bulwark against the Iroquois.

Closely connected with the distinction which has just been made between the Laurentian Valley and the back or upper country (*pays d'en haut*) is the contrast between peasant and woodsman. According to the system of land tenure that prevailed in Canada under the Old Régime rural society was divided between the *seigneurs* or landlords and the *censitaires* or tenants. In Canada, as in France, gentility and the possession of an estate went together, but there is this important difference between the feudalism of the mother country and the colony, that whereas in France the peasants bore appreciable burdens during the 17th century, in Canada no *censitaire* could be seriously crippled by the taxes or services to which he was bound. Feudalism, an institution of the 9th century, could not be transplanted without change to the New World in the age of Louis XIV. The French of Normandy and Brittany made admirable colonists, when once they had been induced to embark; but some prospect of improved conditions must be held out before emigrants would come forward. Moreover in a country of virgin forest it was impossible that peasants should be taxed as their kindred were in a land of ancient cultivation. In view of these considerations the *habitants* received their farms on very reasonable terms How moderate were the demands of the *seigneur* may be seen from a single instance. A deed of 19 June 1694 concedes a lot of land three arpents in front by 40 in depth (about a hundred acres) «in consideration of 20 sous and one good live capon for each arpent of front and one sou of *cens*, payable at the principal manor-house of the seigneury on Saint Martin's day in each year so long as the grantee shall occupy the land.» The *habitant* had in a certain sense the character of a woodsman, for a large part of his time was devoted to hewing down the forest, but he was not a woodsman in the fullest sense of the word. Besides the stationary peasant who cultivated his stump fields in the valley of the Saint Lawrence, the population of New France embraced many restless and adventurous spirits who roved the woods, traded in beaver skins whenever they could elude the monopoly, intermarried with the Indians and evaded the restraints of civilization without punishment from civil or ecclesiastical law. The *coureur de bois* («wood-runner»), to give this type of colonist his generic name, was one of the most remarkable adventurers that this continent has ever seen. Though his vices were an object of scandal to the missionaries and his lawless habits an inconvenience to the government, he possessed the virtues of fearlessness and initiative to an exceptional degree. The comrades of Magellan and Drake were no more daring or resourceful than the *coureurs de bois* who pressed on from the valley of the Saint Lawrence into the wilds of the *pays d'en haut* and found amid the dangers of forest or prairie the fullest excitements of a nomadic life. Their names, for the most part, have perished; but legends like that of the *Chasse-gallerie* bear witness to the hold they preserve upon the memory of French Canada.

In passing from these general statements regarding country and inhabitants, it is hard to say whether a place of greater prominence should be given to the government or to the Church. One should be careful not to represent the French Canadians of the 17th century as slaves — a tendency too current among English writers at the present day. The feudalism of New France was feudalism in its most mitigated form and the *habitant* winning a home for himself by courageous toil seems anything but a serf by instinct. Nevertheless French Canada was overshadowed by two institutions which visibly embodied authority as authority was not visibly embodied in New England or New York. Whether or not paternalism was the bane of Canada is an open question to be answered by the historical student in accordance with his own scheme of philosophy. The broad fact is that the Crown and the Clergy divided between them an extremely large part of the world in which the *habitant* lived. From 1632 to 1663 the affairs of Canada were controlled, under the Crown, by the Company of the Hundred Associates. Had this corporation been better managed, or rather had it been actuated by a larger spirit, it might have gained for itself a distinguished reputation and eventually handed over to the King a flourishing possession; but looking only to the greatest immediate return it wasted a fine opportunity and does not merit comparison with either the East India Company (see EAST INDIA COMPANIES) or the Hudson's Bay Company (q.v.). After 1663 executive power in Canada was deputed by the King to the governor and the intendant, with whom were associated the bishop and a board of councillors varying in number from 5 to 12. The governor, who was always a noble, held the highest office in the colony though he did not possess so much real power as the intendant. He commanded the forces, was the channel of diplomatic intercourse with the English and the Indians, occupied the central place in colonial society and was authorized to follow his own judgment regarding matters of emergency. With finance, however, he had little or nothing to do, and from the whole field of civil administration he was excluded by the presence at his side of the intendant. This official belonged ordinarily to the middle class and had been trained to law or business. The Crown seems to have acted on the maxim «Divide and Rule.» Both governor and intendant were required to send home detailed reports which always included a large amount of criticism and gossip. The intendant passed judgment on the acts of the governor and the governor was not slow to express his opinion concerning the administration of the intendant. Neither received untrammeled authority, for an autocratic King like Louis XIV insisted upon reserving the use of his prerogative. The government of New France was less rigid and cumbrous than that of the Spanish possessions under Philip II, but the principle of absolutism carried out at such a distance from the court could not fail to impair the efficiency of administration.

The position of the Church in New France cannot be properly described unless a reference is made to the dominating influence which controlled Europe during the age of colonization. Seventeen years before Cartier's first voyage to the Saint Lawrence (1534) Luther had denounced the sale of indulgences at Wittenberg. In the interval between Cartier's first voyage and his last (1541) the «Institutes» of Calvin (see CALVIN, JOHN) was becoming the foundation of a Church and the Company of Jesus (see JESUITS) was arising to stem the tide of heresy. Despite the wars of religion and the national exhaustion which they produced, religion was still the reigning issue in France when Champlain sailed westward to continue the work of Cartier. This may be seen chiefly in two ways: from the missionary zeal of the religious orders and from the anxiety of French Catholics that New France be kept untainted by Huguenot misbelief. With De Monts and Poutrincourt, Calvinism made its appearance at Port Royal and a little later it maintained itself for a while at Quebec under the protection of William and Emery de Caën, who did not carry out their promise to exclude heretics from the colony. But during the sway of Richelieu, the Huguenot cause perishes even more completely in Canada than in France, and a way is left clear for the unchecked ascendency of Rome. No one can read the religious literature of New France without recognizing the sincerity of motive which brought Jesuits, Récollets, Sulpicians, Ursulines to Quebec and Montreal. The savage races of America had excited the imagination of all Europe, and in France the desire was particularly strong to rescue these heathen from the doom of the unbaptized. The greatest nobles in the realm subscribed funds for the mission and acted as sponsors at the baptism of Micmac or Algonquin converts. First in importance among the religious orders of New France come the Jesuits, whose missionary tradition had been established more than half a century earlier by Saint Francis Xavier. Entering Acadia and Canada with a record of brilliant success to give them confidence, they prosecuted their labors among all the nations from the Iroquois to the Illinois and from the Ottawas to the Natchez. Their most heroic deeds of self-sacrifice are bound up with their mission to the Hurons (ending in 1649, when the power of the Hurons was destroyed by the Iroquois) and with their mission to the Iroquois covering the third quarter of the 17th century. It was always the aim of the Jesuits to turn the Indians from the nomadic life to the arts of civilization. In this attempt they were but partially successful. Although certain tribes of the Algonquin family yielded themselves willingly to the guidance of the missionaries, the total number of converts was far smaller in New France than in Paraguay. During the first generation after the restoration of Canada to France the Jesuits published in Paris an annual account of the labors undertaken by members of their order among the American Indians. These 'Relations' (see JESUIT RELATIONS AND ALLIED DOCUMENTS, THE) are the best single source of information about the habits of the aborigines and also rank high in the list of our authorities for the history of Canada. Next to the Jesuits in order of prominence stand the Sulpicians, whose efforts centred chiefly in Montreal and the neighboring district. The founding of Ville-Marie de Montréal exemplifies in its purest form the mood of devotion that prompted Frenchmen to leave the civilization of Europe for a life of privation among the barbarous heathen of Canada. Here the colonizing impulse proceeded solely from a desire to spread the faith. With Olier and Dauversière, who founded the Society of Notre-Dame de Montreal, there was no thought of gaining wealth through the fur trade. The charter of the Society expressly states that its members detach themselves from all regard to temporal interest and take for their one purpose the conversion of the natives. From 1642 to the close of the century Montreal was an outpost of civilization and Christianity, exposed to frightful dangers, as the exploit of Dollard (1660) and the Lachine Massacre (1689) testify, but defended by men who cared more for religion than for life. In the relations of the Church with the *habitants* friction seldom arose. There is reason to believe that the Jesuits incurred some unpopularity because they did not favor the appointments of *curés* in the outlying districts, but for the most part the attitude of the peasants toward the clergy was one of complete deference. Until 1665, when the Carignan Regiment came to Canada, the social order presented many features of a theocracy. Religion was supported by the state and derived a stronger support still from the energy of the religious. The prevalent mood was pietistic and public opinion sanctioned the ecclesiastical punishments which were called forth even by minor offenses against morals. Apart from Church festivals the routine of daily life at Quebec or Montreal made little provision for relaxation or entertainment. Taverns were under the ban, dancing parties were unknown and the general demeanor of sobriety would have met favor in the eyes of a New England Puritan. The coming of the Carignan Regiment broke in on this religious Arcadia and proved an entering wedge for frivolity, but in the early days the temper of New France was deeply religious, if not ascetic. One other aspect of ecclesiastical affairs deserves emphatic notice. While the clergy had to do with a docile population and were animated by pure enthusiasm in their work among the Indians, the religious life of the colony was not free from friction. The Récollets, and after them the Sulpicians, felt that their interests were threatened by the enmity of the Jesuits. The Jesuits in turn prevented the Abbé de Queylus, an able Sulpician, from being made bishop of Quebec, casting their influence in favor of Laval (see LAVAL-MONTMORENCY, FRANCIS XAVIER DE), who became the first titular bishop in New France. Laval, once appointed, quarreled with successive governors on different grounds — with Argenson (1661) on the question of precedence, and with Avaugour (1662) on the question of selling brandy to the Indians. The difficulty over precedence brought in the whole issue of Church and state; the quarrel over the brandy question was less lofty but more practical. The position of the Church was that brandy should not be sold to the savages under any circumstances. The general, though not the invariable, position of the government was that if the French did not sell brandy to the Indians the latter would buy rum from the Dutch and English. The Church as a whole and the *habitants* as a whole lived on excellent terms; but there was much friction between the religious orders, the *coureurs de bois* were a thorn in the side of the clergy, and a governor of secular tastes, like Frontenac, might keep up a running feud with the hierarchy for years.

The mention of Frontenac's name recalls a striking personality, for of all the governors who were sent out to New France during the long reign of Louis XIV he must be called the ablest and most forcible. That his policy toward the Church was judicious or free from prejudice cannot be maintained, nor can it be forgotten that his memory is defaced by the stain of fearful massacres. But he was bold, resolute and thoroughly devoted to the interests of Canada. Throughout both periods of his rule (1672–82; 1689–98) he was master of the situation as none of his predecessors had been, and during the seven years of his absence from the colony the failures of La Barre and Denonville served to set off his virtues in the strongest light. The main political problems with which he had to deal were the enmity of the Iroquois, the aggressive policy of the English as suggested by Governor Dongan, and the extension of French influence from the Great Lakes into the valley of the Mississippi. Speaking broadly the Iroquois were the chief menace of Canada in the last part of the 17th century as the English were its chief menace in the first part of the 18th. The most celebrated of the Jesuit martyrs, Jogues and Brébeuf, met death at their hands; the most brilliant deed of courage which the annals of New France contain was Dollard's fight against them at the Long Saut; it was in their face that Madeleine de Verchères shut the door of her father's fort. Whether left to themselves or set on by the English they had every disposition to molest the French. The spirit of conciliation they mistook for weakness and, as Frontenac saw, the only way to impress them was by a show of strength. In 1696 he ravaged their country more thoroughly than De Tracy had done 30 years earlier, burned their palisades, destroyed their corn and convinced them that he had a power which they must respect. The next year their envoys came to Quebec speaking the language of humility. Frontenac's attack upon the English dates from the beginning of his second term of office. Returning to the colony in 1689 he found that French prestige had vanished almost wholly during his absence. To impress the Indians and terrorize the English he equipped those raiding parties which carried the torch and the tomahawk to Schenectady, Salmon Falls and Casco Bay. As a *tour de force* of endurance, this winter campaign of the French was a remarkable feat, but the atrocities which accompanied it cannot fail to awaken the deepest abhorrence. Parkman finds extenuation for Frontenac in the standards of his age. "He was no whit more ruthless than his times and his surroundings, and some of his contemporaries find fault with him for not allowing more Indian captives to be tortured. Many surpassed him in cruelty, none equalled him in capacity and vigor." Everything considered, this must be called a mitigated sentence, and apart from all considerations of humanity it may be doubted whether Frontenac's policy of carnage was a sound one. Its momentary success in impressing the Indians was not an equivalent for the spirit of vengeance which it awakened among the English. From 1690 forward New France and New England have their rancorous enmities which continue to exist quite irrespective of peace or war between the mother countries. Phips may be turned back from Quebec but the memory of massacre endures until French power in Canada has been destroyed. A much brighter feature of Frontenac's régime is the progress made by French exploration in the Far West. While the famous journey of Marquette (q.v.) and Joliet (q.v.) down the upper waters of the Mississippi (1673) may be more fitly connected with the names of Courcelle (q.v.), Frontenac's predecessor, and of Talon (q.v.), the good intendant, the picturesque exploits of La Salle (q.v.) and Tonty (q.v.) fall within the period of Frontenac. It was by favor of Frontenac that the fort at Cataracoui (now Kingston) was placed in La Salle's hands, thus enabling him to establish a fixed base at the east end of Lake Ontario for his operations on the Great Lakes and beyond. As far as the Huron country the French had been on familiar ground ever since the days of Champlain, but their chief triumphs in opening up the *Hinterland* were won under Frontenac.

The 18th century opened for New France with bright prospects which were destined never to be realized. The war that closed at the Peace of Ryswick (1697) had just demonstrated the defensive strength of Canada, and though D'Iberville's (see IBERVILLE, SIEUR D') conquests in Hudson's Bay were restored to England, France did not lose Acadia. Frontenac's chastisement of the Iroquois had brought relief from an ancient scourge and Callières' diplomacy concluded the peace which had been made possible by a decided blow. The War of the Spanish Succession closed less favorably. The success of Vaudreuil's raids was a poor equivalent for Marlborough's victories or even for Nicholson's capture of Port Royal. France lost Acadia and was thrown back for her hope of an Atlantic dominion upon the single fortress of Louisburg (q.v.). The Peace of Utrecht (1713) may be called the beginning of the end.

The history of Louisburg is a tale of great effort, enormous expense and complete disappointment. France lavished upon this harbor in Cape Breton as much money as it would have cost to erect a fortress of the first class in

Europe. Until 1745 its strength remained untested, but the French themselves thought it impregnable and the English looked upon it with dread. The political effect of Louisburg was two-fold. Its near neighborhood to Acadia prevented the French of that province from becoming loyal to British rule, and in New England it was regarded as a permanent menace to peace. When the War of the Austrian Succession offered an excuse, Massachusetts was ready for the attack. Governor Shirley (see SHIRLEY, WILLIAM) devised the plan, which was daringly executed by a colonial fleet under William Pepperell (q.v.) in co-operation with four British men-of-war. The capture of Louisburg by a militia force was the greatest humiliation which France had suffered in America and its restoration by the Peace of Aix-la-Chapelle (1748) (see AIX-LA-CHAPELLE, TREATIES OF PEACE CONCLUDED AT), came to New England as the sorest affront which it had ever received at the hands of the home government.

At the Peace of Utrecht New France contained a population of rather more than 25,000. In 1763 when Canada was ceded to England the number of inhabitants had advanced to about 60,000. It is obvious that this rate of increase was trivial in comparison with the progress of the English colonies during the same period, and when we remember the unusual fecundity of the French Canadians, some special reason needs to be assigned for the slow development of the colony. The cause of this striking phenomenon will be found in the fact that immigration was not spontaneous, as in the case of the English colonies, but controlled by government. Partly owing to the institutions which prevailed in France during the 17th and 18th centuries, and partly owing to gross mismanagement of colonial affairs by the court of Versailles, New France was handicapped in the long race with its southern rivals. This fact must be brought out because it is often erroneously stated that the Frenchman has never made a good colonist. The biography of Canada from Champlain to Montcalm gives the direct negative to such an idea. Maladministration, the lack of local self-government and excess of loyalty to inherited institutions account for the defeat of the French in America rather than the want of promptness, courage, industry and resource. It must be remembered, moreover, that the English colonies took root in a soil which was fitted to stimulate rapid growth. The long calm which followed the Peace of Utrecht (1713–42) was often broken by signs of acute restlessness. As early as 1725 the Marquis de Beauharnois, who had become governor in succession to Vaudreuil, was busy with schemes for keeping the English within the limits they already occupied. This meant that their expansion northward should be checked in the vicinity of Lake George and their expansion westward by the range of the Alleghanies. Far from losing their love of exploration, the French pushed farther and farther westward with each decade. Michilimackinac was to Verendrye what Cataracoui had been to La Salle, and just at the moment when Maria Theresa was preparing to recover Silesia from Frederick the Great, one of Verendrye's sons caught the first glimpse of the Rocky Mountains. In America the hostilities which accompanied the War of Austrian Succession centred at Louisburg and accordingly this conflict affected Canada less than the two preceding wars had done. But every man of colonial origin, English and French alike, saw that the Peace of Aix-la-Chapelle was merely an armistice. Unsettled boundaries suggested endless friction, especially in Acadia and the Ohio Valley. The line which was run by Céloron de Bienville at the instance of France aimed at excluding the English from the Ohio and, according to patriotic opinion in such colonies as New York, Pennsylvania and Virginia, amounted to a *casus belli*. Before the development of the western trade the English and French had been separated by a wide zone of wilderness. The expansion of both races brought them face to face at the junction of the Alleghany and the Monongahela. Should the stronghold built in this angle be called Fort Duquesne or Pittsburgh? Here was an issue on which hinged the future of a continent. It was the misfortune of the French both at home and in Canada that their administrative system suffered from the worst evils of a corrupt absolutism. At Versailles the folly and extravagance of Louis XV, at Quebec the unblemishing thefts of the Intendant Bigot, were but a poor preparation for war. And so the small but valiant race of the Canadian French bore the burden of vices not their own when they entered upon the last act of an irrepressible conflict. See also the articles in this section — GREAT BRITAIN'S FIGHT WITH FRANCE FOR NORTH AMERICA; THE CLERGY RESERVES; SEIGNORIAL TENURE.

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5. GREAT BRITAIN'S FIGHT WITH FRANCE FOR NORTH AMERICA — 1753–63.

For several years previous to the formal declaration of war between England and France, in 1756 (see CANADA — UNDER FRENCH RULE), the stirring events in the Ohio Valley and in distant Arcadia foreshadowed a great crisis, during which territorial disputes, aggressions and political intrigues would be lost sight of for the moment, and the question paramount would be the supremacy of France or of England in North America. The policy of France, as dictated from Versailles, had not been broad enough to successfully promote colonization, in the sense of expansion, or even to maintain permanent occupancy, although this was much desired. And the honest designs of her colonial administrator, La Galissonnière, to increase the dominion of his royal master, at an opportune moment, met with no responsive aid. The mother country was wedded to schemes of aggrandizement at home, and was inclined to leave her colony to work out its own future. Besides, the French then, as now, were rather a stay-at-home people. New France was consequently weak in population, and not in a position to retain her empire in the North, and, moreover, her influence was being undermined by official corruption. Great Britain, on the other hand, had the real advantage of superior numbers in the New World, although she had no definite colonial policy, and was already smarting from the effects of an earlier administration, due rather to ignorance than to knavery. The disputes touching possessions in Acadia were of long standing. By the 12th article of the Treaty of Utrecht (see UTRECHT, PEACE OF), Nova Scotia, within its ancient boundaries, had been ceded to the Crown of England. A controversy soon arose over the interpretation of a certain clause. Great Britain claimed that her possessions under the Treaty of Utrecht were of the same extent as those acquired by France under the Treaty of Breda; but France protested that the territory she then received was quite distinct from the ancient boundaries, which confined Nova Scotia to a portion of the southern peninsula. At the conclusion of the Treaty of Aix-la-Chapelle (see AIX-LA-CHAPELLE, TREATIES OF PEACE CONCLUDED AT), when Louisburg (q.v.) was restored to the French, the boundary questions were referred to commissioners, each Court agreeing that, until a decision was reached, no fort or settlement should be attempted upon the debated ground. But the shrewd La Galissonnière, disregarding the stipulation, if he was ever officially acquainted with it, commenced the construction of forts, and favored settlement upon the lands claimed by England. The importance of Nova Scotia in the future development of Canada was apparent to each nation, both from a strategic and commercial point of view, but neither power could furnish from its colonial resources an army of sufficient strength to support its ambition. The policy of Great Britain toward Nova Scotia was most short-sighted. Instead of encouraging the emigration of a desirable class, intended to grow up with the Acadians and form a united and loyal people, she allowed the French, for nearly 40 years, to regard the country in the light of an exclusive settlement. It is true that they were good subjects; but they were French at heart, and it remained to be proved whether, under extraordinary pressure, their sympathies would incline to France or not. The possibility of such a contingency was for years practically ignored, but when it was seriously considered the methods adopted were ill-advised. The lands of the French were divided and subdivided, until new grants were necessary; but Great Britain decreed that new lands could be acquired only by Protestants. The question of religion, therefore, became a condition of tenure. Shirley (see SHIRLEY, WILLIAM), the energetic governor of Massachusetts, who was largely responsible for the government of Nova Scotia, was firmly convinced that until French influence was exterminated British interests could not flourish; and so he endeavored to effect the conversion of the inhabitants, suggesting that rewards be given to those who renounced their faith. The King favored an assurance that the people should enjoy the exercise of their religion, but Shirley, in a proclamation, omitted the passage as dangerous. The home government then consented to a scheme for promoting the loyalty of the province by the importation of foreign Protestants, to mingle with the Acadians — a fusion possible under the British flag, but doubtful at such a critical moment, when the military organization was insufficient to protect the frontier, or to inspire confidence in the stability of British institutions. Government agents in Geneva, and elsewhere, were active in advertising in the papers for settlers, and bargaining with poor artisans. But the scheme fell through; though at last 3,000 good settlers were landed at Chiboucto Bay in 1749, from which at length sprang the important naval post of Halifax (q.v.). In the meantime, however, a great struggle was impending, which led to the deportation of 8,000 Acadians (see article THE ACADIAN REFUGEES), whose subsequent misery and suffering contribute the darkest page to the history of Nova Scotia. A new oath of allegiance was demanded by Governor Cornwallis, which from time to time was deferred. While, on the other hand, the fiery zealot, Le Loutre (see LE LOUTRE, LOUIS JOSEPH), backed by the Indians, exercised every effort to retain influence over the people. Le Loutre detested the English, and was generally successful in persuading the unhappy people that an oath of allegiance to a Protestant monarch was very much like being disloyal to their faith, the penalties for which did not cease with their natural existence. But, although the dark deeds which were being enacted in 1753, concerning Nova Scotia, had a distinct bearing upon the approaching conflict, they were of secondary importance to the great mass of the British colonists, when compared with the prize which both France and England coveted — the possession of the Ohio Valley. The details of the contest in this section cannot be given here. (See BRADDOCK, EDWARD; COLONIAL WARS IN AMERICA; FORT NECESSITY; PITTSBURGH, *History;* WASHINGTON, GEORGE). The effect of Braddock's defeat was felt in the expeditions of Shirley against Oswego (q.v.), and in that of Johnson against Crown Point (see CROWN POINT, FORTRESS OF). A body of provincials had been raised, and placed under the command of Johnson for the reduction of Crown Point. But Dieskau intercepted, and almost captured, a detachment of this expedition. Reinforcements arrived at a critical moment, and the tables were turned by the capture of Dieskau. This circumstance was made a great deal of, but, nevertheless, Crown Point was unmolested, and still in the hands of the French. War and bloodshed had desolated the homes of the colonists and destroyed their commerce, and over all of them hung the dread of the tomahawk and the scalping knife of the Indian. Panic-stricken, they could devise no means of defense, and surrender seemed preferable to fight. In Acadia, while the two nations were still at peace, the determination of the British had driven into exile the unhappy Acadians. But their own position there was by no means to be envied. British prestige was indeed at a low ebb in America, when the struggle between the colonists was superseded by a contest between the two powers, which commenced officially when King George II signed the declaration of war against France in May 1756.

The situation in New France was indeed acute. Agriculture had been neglected, grain was scarce, horses were slaughtered for food, famine was imminent. But it should be borne in mind that this deplorable state of affairs was not the inevitable outcome of the struggles through which the country had passed, but a condition actually created for profit, toiled for and plotted for by Bigot, in order that he might appear as the real savior of the distressed colony. The advice of the intendant to his somewhat weak-kneed, and certainly dishonest, henchman, Vergor, to "cut and slip, and make hay while the sun shone, in order that he might have the means to build a château in France," was but an indication of the course he intended to follow himself, though on a grander and more colossal scale. New France was to be pillaged. The people must be subdued, and bodily suffering would prove effective where less persuasive methods might fail. New life was given to the colony for a moment when the Marquis de Montcalm (q.v.) arrived in Canada in the spring of 1756, with 1,200 troops and ample supplies. No better general could have been chosen than Montcalm. In fact, men of his mold were just what New France needed most at this time. He was an excellent soldier and had already won renown. He was loyal to his sovereign, at a time when loyalty was not profitable; he was brave and courteous, and he dearly loved France. Vaudreuil, the governor, was a Canadian, and attached to the land of his birth, but he despised every form of interference from France. Hence there was constant friction. Bigot, the representative of the King, loved his master and the colony only in proportion to the measure in which they contributed to his needs; and his needs were of abnormal proportions. The conduct of Montcalm throughout the war, until the supreme hour when he yielded up his life in defense of the colony, forms a striking and pleasing contrast to the actions of his two colleagues. He was also fortunate in the chief officers under him.

England was far less happy than France in the choice of the commander-in-chief of her forces. Lord Loudon, who was placed at the head of the 900 regulars sent out to the colonies, was no match for the brilliant Montcalm. Arriving in Albany two months after he was expected by his chief officers, Abercromby and Webb, Loudon was confronted with a condition of affairs similar to that with which Montcalm had to contend — jealousy between colonials and regulars. The War Office had decreed that a colonial officer could not rank above a senior captain of regulars, and consequently well-seasoned officers, experienced in the methods of the enemy, were liable to orders from a man who had never been under fire, and had no knowledge whatever of colonial affairs. The British general seemed unable to decide upon any plan of action, and much valuable time was wasted. In the meanwhile, disaster had overtaken the British at Oswego. By clever tactics Montcalm had surprised the fort, and had 30 guns directed against it before the commander was aware of the danger which threatened him. There was little effective resistance, and capitulation necessarily followed; 1,600 men were made prisoners, and in a few days the fort was razed. The year was passing away without any important move on the part of the British. Loudon desired a change of scene, and induced the home government to agree to an expedition against Louisburg. Large reinforcements were sent out, and in the month of June 1757 he had nearly 12,000 men arrayed against that stronghold. Still unable to decide upon a plan of attack, he wasted a month in exercising the troops, or, as Lord Charles Howe said, "In keeping the courage of His Majesty's soldiers at bay, and in expending the nation's wealth in making sham fights and planting cabbages, when they ought to have been fighting the enemies of the King in reality." On 4 August a movement was set on foot, but intelligence was conveyed to the commander that the French expected reinforcements and were eager for the fray. Thereupon, the noble lord abandoned the enterprise and returned to New York, having covered himself with ridicule, and greatly amused the French.

In the spring of 1757, the region of Lake Champlain was the scene of unusual activity. The Indians from the distant shores of Lake Superior, and from the forests beyond Lake Erie, were rallying around the French standard; and by midsummer a restless band, eager for the fray and only restrained with difficulty, gathered at Fort Carillon as part of the expedition against the British strongholds of Fort Edward and Fort William Henry. Montcalm's army consisted of about 6,000 of the best troops, with the addition of the Indians. The British force was divided between the two forts. Webb was at Fort Edward in command of 3,500 men, and Munro had 2,000 men in Fort William Henry and 500 entrenched upon a rising ground in the rear of the fort. Montcalm's first move, on approaching, was to occupy the route communicating with the forts, which, at the same time, cut off the British troops upon the rising ground. This was accomplished by de Lévis with 3,000 men. Montcalm strengthened his position and soon had 40 guns bearing upon the fort. From the first it was clear that the British position was untenable. Munro was twice offered terms of capitulation, but he stubbornly refused. At length he was forced to surrender, and the garrison marched out of the fort. Then followed a frightful scene, which has unjustly tarnished the memory of Montcalm. The Indians, disappointed of the plunder to which they looked forward at the sack of the fort, fell upon the prisoners with fury, and horribly massacred nearly 100 before any means could be taken to prevent them. Montcalm and Lévis did their best to arrest the fury of the savage hordes and saved many lives; but the mischief was done, and dire vengeance was threatened. Notwithstanding the dismal failure of Loudon, Pitt was still determined to reduce Louisburg, which was to be made the chief objective in the campaign of 1758. Loudon had been recalled, and the command was entrusted to Amherst, who had already done good service in Germany. The chief officers under him were Lawrence and Wolfe. The force consisted of about 12,000 men. On the 2d of June part of the fleet anchored in Gabarus Bay, a few miles from Louisburg, Boscawen being the admiral in command. The expedition was a joint one, both naval and military. Wolfe was the most conspicuous figure of all present. His brigade made the real attack from the boats, while Whitmore's and Lawrence's supported him by feints in other places. The landward siege was well pressed home, and Louisburg, the gateway of New France, soon fell, and being shortly after razed to the ground, literally became a thing of the past.

Success had attended British arms in other quarters. Bradstreet at the head of 3,000 men had captured Fort Frontenac, which the unwisdom of Vaudreuil had left inadequately supported, although it was a most important post commanding Lake Ontario and serving as a base for the Ohio forts. De Noyan, the governor, had demanded reinforcements, but, in the place of troops, Vaudreuil had dispatched a one-armed man to his assistance, and, as resistance was futile, capitulation followed. Fort Duquesne had also become a British post, and now bore the name of Fort Pitt. Forbes, in the face of great difficulties, had endured the perils and suffering of a winter's march; and, when at last his bravery and determination had triumphed over every obstacle, and the fort was in sight, he found that it had been evacuated. While Loudon was «planting cabbages,» a harmless occupation, Abercromby was making a worse mess of affairs at Ticonderoga (q.v.). The French had been expecting an attack at this vital point, which commanded the route by way of Lake Champlain, and threatened Montreal. A large body of men had been ordered there in the spring by Montcalm; but the withdrawal of so many troops under Loudon had convinced Vaudreuil that it would be an opportune moment to create a diversion on the Mohawk. Montcalm was opposed to this enterprise; consequently Vaudreuil insisted, and 1,600 men were detached for the purpose. By the middle of June Montcalm had only 3,000 men at Ticonderoga, the battalions of La Sarre, Languedoc, Béarn, Berri, Guienne and Royal Roussillon, with two good engineers. The place was by no means strongly fortified, but works were hastily thrown up in advantageous positions. In the meantime the formidable army under Abercromby, consisting of regulars and provincials, in all 15,000 men, was encamped about half a mile from the fort. But the real head of the army, Lord Howe, the best soldier in America, as Wolfe had said, had been killed in a preliminary skirmish, and the commander was powerless to act. Something had to be done, however, and Abercromby moved his whole force against Carillon. Montcalm's army had been increased by 500 men under de Lévis; and after a seven hours' blundering assault, Abercromby was completely outgeneralled, and lost no less than 2,000 men. This victory covered Montcalm with glory, and he is frequently referred to as «the hero of Carillon.» But although he had won glory for French arms, the victory was a blow to the jealous Vaudreuil, and signalized the farther accentuation of discord which produced serious results in future operations.

In 1759 Pitt was at last in a position to put his greater scheme into practice. The tide of war was almost on the turn, and he seized opportunity beforehand. The Seven Years' War (q.v.) was being waged in many parts of the world; in fact, in a purely military sense, there were several different wars going on at the same time. But there was one great connective force which made them one, and that was the British navy. France and England were now in the very middle of their great imperial war, which began after the fall of the Stuarts in 1688, and was continued as one single age-long and world-wide struggle for the over-sea dominion of the world, down to Trafalgar and Waterloo. The Seven Years' War was the most distinctively imperial phase of the whole of this vast conflict; the heart of it lay in the fight for American dominion; and the central episode of this fight itself is to be found in the expedition against Quebec, which culminated in the renowned battle of the Plains of Abraham. The four real conquerors of New France are Pitt, Anson, Saunders and Wolfe. The names of Pitt and Wolfe have always been on every tongue; but the equally important ones of Anson and of Saunders have been unduly forgotten. Pitt, of course, was the originator; and in himself, the most important of the four. But as the whole fortunes of the war were really determined by the British command of the sea, it is absolutely necessary to understand the naval side of the campaign, not only for its own sake, but also to fully appreciate the work of the army. In the ever-memorable year of 1759, it was entirely due to the navy that England remained safe at home, and it was more than half due to the navy that she emerged as a conqueror abroad. France had prepared a gigantic scheme of invasion. One fleet was to sail for Ireland, where the troops were to be met on landing by a general rising in their favor. The Jacobites were to be stirred into insurrection by another French fleet destined for Scotland; whilst their third fleet, larger than both the others united, was to convoy innumerable troop-boats across the Channel, as they made a dash for the south of England. To guard against this national danger the navy then developed the first regular system of blockade ever known. Boscawen blockaded Toulon, Hawke blockaded Brest, Rodney cruised off Havre and Admiral Smith kept the reserve fleet always ready in the Downs. Meanwhile, however, Pitt was preparing a counterstroke; not at France herself—where she would be stronger than England in a campaign fought out on her own home base—but at her over-sea possessions in Canada, from which she was separated by those 3,000 miles of hostile waters, which the British command of the sea had practically made a British possession. Thus Montcalm had to await attack in utter isolation, on the far side of an immense stretch of territorial waters, across which Wolfe advanced in perfect safety to meet him. And it must be remembered that Saunders' squadron was not only a strong one, for it comprised a full quarter of the whole navy, but that it was playing an integral part in a universal scheme of strategy—for all seas are strategically one—whilst Wolfe's little army was only a landing-party on a large scale. There were twice as many seamen as landsmen engaged in the taking of Quebec. Saunders had over 18,000 sailors, more than two-thirds of whom belonged to the navy, while Wolfe had less than 9,000 soldiers. The total British force, therefore, amounted to 27,000 men. Saunders and Wolfe received their secret instructions from the King in February, and immediately after sailed for Nova Scotia. The final rendezvous was Louisburg, where over 8,000 men were assembled in May. On 1 June the fleet began its dangerous voyage, with no less than 200 vessels of all sorts and sizes. It was navigated in perfect safety to the Island of Orleans, where it arrived on 27 June, and was not injured by a tremendous gale a day or two later, nor by the costly display of fireworks, in the shape of fire ships, destined to work its destruction. The picket boats met the attack well up stream, and, «taking hell in tow,» as a bluejacket forcibly expressed it, put all the enemy's vessels ashore, where they burnt themselves out. Wolfe established three camps. The principal one was at Montmorency, just beyond the falls. The second was on the Island of Orleans, completely out of range, and thus very convenient for a hospital and stores. The third was at Point Levis, which Vaudreuil foolishly refused to occupy, in spite of Montcalm's sensible advice, and which was consequently left open for Wolfe to build his batteries on. These batteries literally pounded the town to pieces; as a manuscript note on a plan of the siege in the French War Office truly remarks, «*ce ne fut pas un siège, mais un bombardement.*» Among other projectiles of all kinds, 36,000 solid cannon balls were fired from this coign of vantage. Montcalm's position was still immensely strong, in spite of the loss of the Levis Heights. The upper town of Quebec is built upon the extremity of a long promontory which is bounded on the south by steep cliffs, 200 or 300 feet sheer up above the Saint Lawrence, and on the north by lower, but still easily defensible, cliffs overlooking the valley of the Saint Charles. The town was held by 2,000 men under de Ramesay. It had a double tier of batteries, one on the top of the cliffs, the other along the water front below them. The only open ground in the vicinity was round the mouth of the Saint Charles. But this was well entrenched, and the trenches were carried on continuously for seven miles along the Beauport shore to the Montmorency, opposite Wolfe's camp.

Wolfe's first attempt to break through was made some distance up the Montmorency, where he tried to force his way across the fords and so attack the entrenchments in the rear. But he was repulsed with loss, in a bush-fight in which his regulars were at a great disadvantage. His second attempt was a more serious one. On 31 July he tried to carry the Montmorency Heights by storm, a mile on the Quebec side of the falls. But as his troops had to be collected from several quarters, in full view of the French, Montcalm easily anticipated him at the right spot, before he could deliver the assault. Besides the faulty British plan could not be carried out even according to Wolfe's intentions, because the grenadiers, 1,000 strong, suddenly broke into a wild charge before being properly formed up, and lost nearly half their numbers in a fruitless effort to scale the heights. Then a terrific thunderstorm burst on the scene of carnage, making the heights more slippery than ever, and so he had no choice but to call off his men at once. After this repulse Wolfe fell seriously ill, and toward the end of August he gave his brigadiers, Monckton, Townshend and Murray, a memorandum of three other plans for assaulting the trenches and asked them «to consult together for the public utility.» Their council of war resulted in a complete rejection of all his suggestions; because, as they well remarked, the storming of such works from open ground would certainly be both difficult and dangerous. Moreover, even if the works themselves were carried, there would still remain the fortified line of the Saint Charles, as well as the heights of the promotory beyond, to keep him out of Quebec, until the lateness of the season would compel him to raise the siege. Their own plan was to take all the available men up the Saint Lawrence, and land at any suitable point between Cap Rouge, which was nine miles, and Pointe aux Trembles, which was 22 miles, above Quebec. Wolfe informed Pitt, in a dispatch written on 2 September, that he had acquiesced in this plan, and intended to put it into operation at once.

The Montmorency camp was cleverly evacuated, without the loss of a man, by a general naval and military demonstration against the entrenchments, which made the French feel sure that another attempt to storm the position there was about to take place. From 7 to 10 September the rain suspended all operations; and on 10 September Wolfe made his final reconnaissance. He was already well posted on the lie of the land in every direction, and the idea of attacking above Quebec was thoroughly familiar to his mind long before it was mentioned by his brigadiers. On 19 May he had said to his uncle, that he «reckoned on a smart action at the passage of the Saint Charles unless we can steal a detachment up the river and land it there, four, five miles, or more above Quebec.» This plan was better than the brigadiers', as it contemplated seizing the ground much closer to Quebec than the nearest objective point they proposed trying. At the final reconnaissance he chose the Foulon, where a path led up to the Plains of Abraham, within two miles of the walls. If he could get up there without any serious check, he saw that he could forestall Montcalm by forming a line less than three-quarters of a mile from the city, where the promontory was narrow enough to be commanded by his small army, and where the mixed regulars and irregulars of New France would be forced to meet his homogeneous British red-coats on a flat and open ground. The French were on the alert everywhere along the north shore, from the falls up to Pointe aux Trembles, a distance of 29 miles — except just at the Foulon itself. They could not tell what Wolfe was about, nor where the bulk of his men were, behind the impenetrable screen of the ubiquitous British fleet. They were naturally very apprehensive of another desperate attack on their trenches; they were well prepared against an assault upon the town, which was so strongly fortified by nature; while the constant movement of the fleet, and occasional landings from it, in the vicinity of Pointe aux Trembles, 22 miles up, made them think that any new plan would probably take the form of an advance in force by land from somewhere thereabouts. One man, indeed, besides Wolfe, was thinking of the Foulon, and that man was Montcalm. On 5 September he had sent the regiment of Guienne to the Heights of Abraham, but Vaudreuil withdrew it on 7 September, and left no defense there, except the puny Samos battery near Sillery Point, and 100 militiamen at the top of the Foulon, under the treacherous Vergor. Even on 12 September, the very eve of the battle, Montcalm had again ordered the same regiment back, this time to the Foulon itself. However, Vaudreuil had again countermanded the order, saying, «We'll see about it to-morrow.» But Wolfe himself was up there on that morrow! [For some account of the battle of the Plains of Abraham, see COLONIAL WARS IN AMERICA; MONTCALM; QUEBEC; WOLFE.]

The winter at Quebec, after its capture, was a terribly trying one for the little British garrison; and so many men died of scurvy that, in the following April, when de Lévis marched out of Montreal with 7,260 men, expecting several thousand more to join him on the way, Murray could only muster 3,886 effectives. There was a second battle of the Plains, in which Lévis defeated Murray, who in less than two hours lost over one-third of his men. A second investment followed, and Lévis was in the act of advancing to storm the walls, when the vanguard of the British fleet suddenly entered the harbor. The French had now no choice of action. They hurriedly abandoned their camp, and retreated, in all haste, on Montreal, both by land and water. Then, step by step, the final British advance converged on the doomed colony. Murray came up steadily from Quebec, in close touch with Lord Colville's squadron, which the French had absolutely no means of resisting. Haviland advanced from the south by way of Lake Champlain; while Amherst, with the main army, came down the Saint Lawrence from the Lakes. When the united British army, 17,000 strong, actually landed on the Island of Montreal, the few remaining Canadians deserted Lévis in a body, and he found himself left with only some 2,000 of the faithful French regulars. The capitulation of New France occurred two days later, on 8 Sept. 1760. The French troops were deported. The Canadians had already dispersed. The American militia went back to their homes. The fleet sailed away to their stations. The British regulars took up their winter quarters. And the New Régime began. The Seven Years' War was one of the most pregnant events in history; and its results have continued to exert a vast determining influence on the fortunes of every world power, down to the present day. In Europe it foretold the ultimate decline of France and Austria, and the ultimate rise of Prussia to the leadership of Germany. But its significance for the English-speaking people lies mainly in the fact that it was the most truly imperial war they ever waged; and its most dramatic episode —the battle of the Plains of Abraham — will serve to mark forever three vital stages in three great epochs of modern times — the passing of Greater France, the coming of age of Greater Britain and the birth of the United States.

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6. UNDER BRITISH RULE TO CONFEDERATION (1760–1864). At the moment when Vaudreuil (see VAUDREUIL-CAVAGNAL, PIERRE) capitulated to Amherst (September 1760) (see MONTREAL — *History*) there were no English in Canada save the troops and a few civilians who had come with them. But, outwardly at least, this act of surrender placed the French Canadians and the English colonists in America on the same basis as subjects of the British Crown. One sovereignty was thus established over a vast area where dwelt two races whose origin, sentiments, faith and institutions marked them off from each other in the sharpest contrast. A century later the face of the situation was profoundly changed. The American Revolution had created a second sovereignty in this region at a time when the population of Canada was almost wholly French, and yet by 1860 the Canadian English had come to outnumber the Canadian French. The maintenance of the bond with Great Britain, the rise of the United States and the influx of English settlers are the broad conditions which have affected the progress of Canada since the cession.

Three years elapsed between Vaudreuil's surrender and the Treaty of Paris, which confirmed Great Britain in the possession of her American conquests. During this interval the country remained under military rule, and though General Murray's relations with the subject population were marked by sympathy and tact, it was impossible that a sense of permanence should be inspired by such a document as the Act of Capitulation. The text of the treaty, in its turn, left many essential points unsettled, especially in the domain of law, and not until 1774, when the Quebec Act was passed, did French Canada receive from the British Crown and Parliament a charter upon which it could rely. The first 14 years of British rule were, however, a time of great importance in that the experience gained during this period suggested legislation which continues in force at the present day. The mass of the French population, *seigneurs* and *habitants* alike, accepted the change of masters in a spirit of resignation. Their courageous support of Montcalm and Lévis is proved by a large variety of evidence. They seem to have shown as much daring as the French regulars, together with a superior knowledge of the country and a better grasp of the tactics which were suited to American warfare. That the deportation of the Acadians had stimulated their resistance to the British is more than probable, but in any case loyalty and patriotism would have led them to make a brave defense. Once beaten, they accepted the situation frankly and were not encouraged to rebel by that restlessness of the Indian tribes which took form in the conspiracy of Pontiac (1763–64) (see PONTIAC). The contrast between their docility and the growing disaffection of New England and Virginia did not fail to leave an impression on the official mind both in Quebec and London. The result was that when difficulties arose between them and their English fellow-subjects the government was not disposed to espouse the cause of the latter. Apart from the retention of their property, the guarantee of their religious institutions was the question which came nearest to the hearts of the French Canadians. By Article 27 of Vaudreuil's Capitulation it was agreed that "the free exercise of the Catholic, Apostolic and Roman religion shall subsist entire, in such manner that all classes and peoples of the town and rural districts, places, and distant posts may continue to assemble in churches, and to frequent the sacraments as heretofore, without being molested in any manner, directly or indirectly." This clause of the capitulation was confirmed at the Treaty of Paris (see PARIS, TREATIES OF) with the condition "as far as the laws of Great Britain permit," but any restriction which might seem to be placed upon religious toleration by the foregoing phrase was nominal rather than real. The communities of nuns were not disturbed even at first, and after a few years of deprivation large estates were restored to the Sulpicians. The Jesuits also would probably have received a confirmation of title but for the special circumstances attending their suppression in France shortly before the Treaty of Paris and their general suppression in 1773. As it was, the scrupulous care with which governors like Murray and Carleton (see CARLETON, SIR GUY) carried out the policy of toleration reassured the hierarchy and made it a firm supporter of British rule.

Had there been no other factors in the political life of the country than the government and the French Canadians, the first years of the new order would have been peaceful enough. It is true that the commission of Governor Murray (1763) was marked by ill-advised expressions. For example, the members of such an assembly as might hereafter be convened by the governor and council "shall, before their sitting, take the oaths mentioned in the act entitled 'An Act for the further security of his Majesty's person and government, and the succession of the Crown in the heirs of the late Princess Sophia, being Protestants,'" etc. In other words, every French Canadian who aspired to sit in the assembly of the colony must subscribe a declaration against transubstantiation, the adoration of the Virgin and the sacrifice of the mass. Such language (borrowed from the laws of England) would have seemed offensive had political life become active in the colony, but as no assembly was convened till 1791 it remained shorn of practical significance. Real difficulty sprang less from the disaffection of the "new subjects" than from the presence in Canada of certain "old subjects," that is to say, of the English who had come to Quebec and Montreal at the close of the war. Here was a fresh element in the population, small but active and bitterly opposed to the recognition of French institutions. Prior to the outbreak of the Revolution an influential proportion of the English living in Canada were natives of the American colonies who had moved to the northern part of the British dominions with the design of enriching themselves through the fur-trade. Their antagonism to the French was prompted partly by race and religion but also by dislike of French law and contempt for the conservatism of French character. Their plea was that since the fate of war had given Canada to the English the country should be made in the fullest sense a British possession. These "old subjects," but just arrived in the colony, would have uprooted French law, discouraged the use of the French language, destroyed or fettered the hierarchy, and incidentally have made themselves a dominant class. At no time before the passage of the Quebec Act could they have formed more than a fiftieth part of the population, but, owing to the strength with which they raised the cry of the ruling race, they enjoyed a position of great prominence. Unfortunately for the success of their program, they incurred the dislike of the local authorities by an extreme radicalism of utterance and demeanor. Carleton, in particular, discountenanced them and held them to be infected with the mutinous views which were becoming so increasingly prevalent in the English colonies.

Sir Guy Carleton, afterward Lord Dorchester, is the most striking figure in Canadian history from the Conquest to the days of responsible government. The close friend and confidant of Wolfe, he began his career as a soldier. Circumstances made him an administrator and he ended by reaching the full stature of a statesman. Those who approve the policy embodied in the Quebec Act will, of course, rank him higher than he will be ranked by those who deny the wisdom of that far-reaching measure, but regarding the quality of his mind, the firmness of his temper and the justice of his intentions, opinion is undivided. After serving with distinction in the campaigns of 1759 and 1760 he returned to Canada as administrator of the government in 1766. In 1769 he became governor-in-chief; and from this date until his final surrender of office in 1796 he remained among all Englishmen the leading authority on Canadian affairs. The Quebec Act was the fruit of information and advice which he supplied; it was he who repelled Montgomery's invasion, and the Constitutional Act of 1791 which gave the colony its first training in self-government was largely his work. During a formative period of 30 years his policy of generosity toward the defeated race was the policy of the British government. Murray, whose language reflects personal resentment, says of the "old subjects": "I report them to be in general the most immoral collection of men I ever knew." Carleton, though less severe in his strictures, formed a highly unfavorable opinion of them and expressed his preference for the French Canadians with perfect freedom. According to his forecast, which in this respect has not been altogether justified, the valley of the Saint Lawrence was unlikely to be inhabited by any large number of Englishmen. Most of the English who were then resident in Montreal and Quebec had come in the train of the troops and would probably return with them. The traders had not been successful and would soon disappear. To quote his own words, it remained that "barring a catastrophe too shocking to think of, this country must to the end of time be peopled by the Canadian race." The Canadians, he continues, "are not a migration of Britons, who brought with them the laws of England, but a populous and long-established colony." Thus believing that the French could never be supplanted he concluded that their customs, ecclesiastical and legal, should be retained. A detailed statement regarding the Quebec Act will be found elsewhere (see the article THE QUEBEC ACT). Here it need only be said that its territorial provisions were extremely distasteful to the English colonies and that its concessions to the French Canadians have supplied a solid ground work for their loyalty to the British Crown. Whether Sir Etienne Taché was correct when he said, "The last gun that will be fired for British supremacy in America will be fired by a French Canadian," must be termed matter of conjecture; but the sentiment which prompted him to speak so fervently was gratitude for the Quebec Act. This measure provided an unobjectionable oath of allegiance, sanctioned the Roman Catholic religion in so far as it did not conflict with the King's supremacy, and ordained that "in all matters of controversy relating to property and civil rights, resort shall be had to the laws of Canada as the rule for the decision of the same." Hence English criminal law and French civil law were established side by side in the regions covered by the act. When Upper Canada was constituted in 1791 it received the common law of England unmodified and unlimited, but French civil law still survives in the province of Quebec.

At the same moment when Great Britain was endeavoring to meet the wishes of her French subjects, the question of Canada was becoming an additional source of friction between the mother country and her older colonies in America. Not only did the English colonies disapprove a policy which heaped such favors upon the French, but some of them resented the King's disposition of the recently acquired territory to the west of the Alleghanies. In the royal proclamation of 1763 nothing was said concerning the government of this valuable region, an omission which disappointed Virginia and other colonies ambitious of expansion. Worse still, the Quebec Act handed over the western country to Canada, shutting out the older colonies and rendering an immense area subject to the operation of French civil law. At any time such action would have provoked remonstrance; in 1774 it quickened the resentment which had been gathering force ever since the passage of the Stamp Act. How prominent Canada was in the eyes of the Continental Congress may be inferred from the decision, speedily formed, to gain control of it by force. The sequel was a severe blow to the Revolutionary cause. Montgomery (see MONTGOMERY, RICHARD), advancing by Lake Champlain and the Richelieu, occupied Montreal and nearly succeeded in capturing Carleton, who was the head and front of the defense. Simultaneously Benedict Arnold (q.v.) made his way through the woods of Maine to the valley of the Chaudière and despite dreadful privations appeared before the walls of Quebec. On the arrival of Montgomery from Montreal a siege was commenced, but the sufferings of the troops proved so intolerable that it was decided to carry the town by assault. On 31 Dec. 1775, the two generals made a desperate attempt to force a passage through the streets of the Lower Town. During the fight which ensued Montgomery was killed and after a sharp encounter Carleton drove out the invaders with heavy loss. The war in Canada dragged on during the greater part of 1776 but before the close of that year the Americans had been repulsed at all points and the issue, so far as it affected Quebec, was decided. On the British side the hero of this campaign is undoubtedly Carleton, who maintained his position against heavy odds; but considered historically the attitude of the French Canadians is no less interesting. The clergy and the *seigneurs* used their influence actively on behalf of the British; the *habitants* remained neutral. It seems clear, however, that without the aid which he received from Canadian volunteers, Carleton would have been beaten, and it is also manifest that the French peasantry did not respond with any heartiness to the appeals of the Continental Congress.

While Montgomery's invasion is an exciting and critical episode, the Revolution affected Canada still more profoundly by causing the emigration of the United Empire Loyalists (see AMERICAN LOYALISTS). Into the nature of their differences with the American patriots it is not necessary to go, beyond stating that each party represented a definite point of view and was separated from its opponents by the wide gulf of contrasted ideals. The Loyalists represent the conservative element in the 13 colonies and undoubtedly embraced within their ranks a large proportion of distinguished, educated men. Including those who left their homes while the war was in progress and those who came northward after its close, we may place the total number of Loyalist emigrants in British North America at nearly 40,000. More than half of these newcomers settled in the neighborhood of the Bay of Fundy, particularly in the region which now forms the province of New Brunswick, but at least 10,000 of them made their way to Canada. It is at this period that important settlements are first established upon the northern shore of Lake Ontario, where a population exclusively English possessed itself of lands which the French had explored but never colonized. The population of Canada was further modified between 1783 and 1800 by the opening up of the Eastern Townships, a district situated on the northern border of New Hampshire and Vermont, with a short frontier on the northeastern corner of New York. Here the original settlements were made in part by Loyalists but more largely by emigrants from New England who moved north in quest of cheap land. At the close of the Revolution, then, the race question in Canada begins to assume a very different aspect from that which it had worn before the passage of the Quebec Act. Then the English population constituted a mere handful. Now, through the steady influx of immigrants from the United States fresh portions of the country are developed and a nucleus is formed round which later accessions of English-speaking colonists will range themselves. As the bulk of the new population professed the deepest affection for Great Britain, a separatist movement was not to be thought of, but it was equally certain that disagreement would arise within Canada over the issue of legal and ecclesiastical institutions. As early as 1785 the Loyalists resident on and near Lake Ontario sent a petition to England praying that they might enjoy "the blessings of British laws and British government and of exemption from French tenure of property." Carleton, now Lord Dorchester, was eminently suited to effect an arrangement between the Loyalists and the French Canadians, toward both of whom he was drawn by feelings of strong sympathy. After establishing in 1788 special regulations for the administration of districts inhabited by Loyalists, he assisted in the preparation of the Constitutional Act (1791), a measure which was designed to do away with the grievances of the Loyalists without creating a sense of grievance among the French. Under the Constitutional Act, which in the British Parliament received support from Pitt and Burke, a division was made between Upper and Lower Canada. For each of these provinces the act created a legislative council and an assembly, but no independent power with respect to tariff legislation was granted. Clergymen of whatever denomination were declared ineligible to sit either in the council or the assembly, but freedom of worship was guaranteed to the Catholics in perpetuity and the Protestant clergy received as an endowment one-seventh of all waste lands belonging to the Crown. Some idea of the relative importance of the two provinces at this date may be gathered from the fact that in Lower Canada the legislative council was to consist of not less than 15 members, while in Upper Canada the minimum number was placed at seven. A still greater disproportion existed between the number of members in the assembly — the minimum of 50 in Lower Canada as opposed to a minimum of 16 in the other province. Although grave troubles afterward arose under the operation of the Constitutional Act, the measure seems to have encountered little opposition in Canada save from the English minority in Quebec, whose leaders looked forward with discontent to the prospect of political inferiority. No tests excluded Roman Catholics from the council or the assembly, and after the elections of 1792 the latter body in Lower Canada contained 34 French as against 16 English members.

Within six months from the day when the first Canadian legislature met, Great Britain joined Austria and Prussia in their war against revolutionary France. While British North America was not drawn into the vortex of England's contest with the Convention, the Directory and the Napoleonic empire, it felt the influence of that long struggle in more ways than one. Besides Canada's part in the War of 1812, which was a by-product of the larger strife, one must mention the attempt of French republicans to make trouble for England in Lower Canada, and a certain neglect of Canadian issues by the home government which may be ascribed to the pressure of more critical questions in Europe. At about the same time when Genet was endeavoring to raise the United States against Great Britain, agents of the National Convention sought to provoke a disturbance among the *habitants* of Quebec. The execution of McLane and the imprisonment of Fréchette for life are the chief incidents in this abortive undertaking. Of much more consequence was the failure of the colonial office to watch the working of the Constitutional Act in Lower Canada. The council, whose members were appointed by the governor, speedily became a stronghold of English interests. The assembly, whose members were chosen by popular vote, assumed no less speedily a French complexion. As the council considered itself to represent the dominant power and was quite free from the control of the assembly, it tended to assume a tone which was extremely offensive to the French majority in the other house. The Constitutional Act gave representation but did not recognize the principle of ministerial responsibility to the popular branch of the legislature. In an age of mounting democracy, this type of government was open to fierce attack, especially when the question was complicated by racial prejudice. Between 1791 and 1812 the most maladroit governor of Lower Canada was Sir James Craig, who for three years (1808–10) carried on open strife with the assembly and finally had recourse to a *coup d'état*. In his assault upon the *Canadien*, a Nationalist newspaper, he unwarrantably arrested Bedard as the publisher of treasonable articles, dismissed Panet, the speaker of the assembly, from the militia, and eventually imprisoned six of the leading members of the assembly. Craig's action was due to a sincere belief that the French Canadians were disloyal because they criticized the council, but the effect of his measures was most unfortunate, since the Colonial Office could not fail to be identified with them in the public mind. The political life of Upper Canada during the same period was unmarked by any notable dissensions. Through no fault of her own, and simply by virtue of being a British possession, Canada was drawn into the War of 1812 (see UNITED STATES — THE WAR OF 1812). Among the causes of the war, the only one which concerned her directly was the ill-founded contention that English officials were trying to stir up an Indian attack upon the American colonists in the West. From the outbreak of hostilities till the conclusion of peace Canadians of both provinces conducted the defense of their country in a truly patriotic spirit. The Loyalists were stimulated by the memory of their expatriation and fought enthusiastically for the British cause under Brock and Sheaffe. The French Canadians guided by Bishop Plessis (see PLESSIS, JOSEPH OCTAVE) of Quebec, himself the descendant of a New England captive, displayed an attachment to England which had not been so clearly apparent at the time of Montgomery's invasion. De Salaberry's victory at Chateauguay showed that the French peasants had not lost their ancestral courage or their knowledge of the methods to be pursued in guerilla warfare. At Queenstown Heights (see QUEENSTOWN) and Lundy's Lane (see LUNDY'S LANE, BATTLE OF) the Loyalists acquitted themselves well in the open field. The War of 1812 contributed much to the formation of a patriotic sentiment which was independent of provincial bounds.

The political unrest which affected most civilized countries in the generation following the battle of Waterloo appeared in Canada under an acute form and was not quieted until after the rebellion of 1837. The Upper Province, free from the problem of a mixed nationality, had hitherto been undisturbed by violent disputes, but as time went on the Constitutional Act was found unsatisfactory — or rather, the act gave no redress of the grievances which grew up under the existing system of administration. In Lower Canada the claims of the assembly found an eloquent champion in Louis Joseph Papineau (q.v.), the most prominent French Canadian of his generation. It should be clearly pointed out that the grounds of discord were different in the two provinces, but the development of agitation went on simultaneously and the two movements, each proceeding from its own set of conditions, reacted strongly on each other. English radicals and French radicals were brought into close sympathy as agitators by their common opposition to the established order. In both cases there were minorities whose privileges depended upon the maintenance of the constitution and the bitterness of the struggle for responsible government was intensified by the presence of these vested interests. In Upper Canada the contest between officialism and reform did not centre round the first principles of politics so much as it did round the exercise of power by certain individuals. The main strife was one of old settlers against new, with several minor issues coming in to complicate the situation and render it disagreeable. A few families of Loyalist stock constituted a local oligarchy from which were drawn the chief officials of the colony. As the members of this ruling class belonged almost wholly to the Anglican

Church, and used their influence freely to benefit the Anglican clergy, they provoked the opposition of the dissenters who formed a majority of the more recent immigrants. The political solidarity of Anglicanism and the "Family Compact" led both to be denounced by the champions of responsible government — Robert Gourlay, William Lyon Mackenzie, Dr. Rolph and Egerton Ryerson. The clergy reserves were represented as a symbol of government by privilege and Roman Catholics united with Protestant dissenters to demand the application of their proceeds toward the support of schools. It will be seen that these sources of discontent were hardly of a fundamental character, but the population of Upper Canada was not one to bear political grievances lightly. In Lower Canada the situation was more intricate and more serious. When the excitement caused by the War of 1812 had died away, the relations between council and assembly resumed their former rancor, while the assembly and the executive became involved in a protracted dispute over the power of the purse. By the financial provisions of the constitution certain revenues were at the disposition of the Crown and the assembly had control of certain other revenues which originally were much smaller. Through the development of the colony, the assembly's share of the revenue kept growing larger in proportion to that of the Crown, and at he same time the Radicals discovered that they could place the government in a very awkward position by refusing their assent to appropriations. The advantage which the assembly possessed through its power to keep up a perpetual dispute over fiscal matters was used with much tactical cleverness, though perhaps with less genuine patriotism than might have been desired. The fight against privilege (and there can be no doubt that the council had excessive privileges) was accompanied by a revival of racial feeling among the French Canadians. With Papineau for their leader the Nationalist majority in the assembly used language which showed that their brightest ideal was not summed up in subjection to British sway. Gradually the English element was eliminated from the ranks of the reformers, and though a few politicians of English and Irish name supported Papineau during the disturbances of 1837 his sole hope of success lay in the support of the French. Under such a system of government as was provided by the Constitutional Act, the rôle of the governor assumed a degree of importance which it does not possess at present in any self-governing colony of the British Empire. Had abler men than Sir Francis Bond Head and Lord Gosford represented the Crown in Upper and Lower Canada during the acrimonious debates of 1836, there might have been no breach of the peace. As it was risings took place in both provinces, the Radicals of Upper Canada being encouraged by some initial successes which the party of Papineau had gained in the autumn of 1837. The rebellion cannot be dignified by the name of a war since the engagements were accompanied by slight fatalities and the issue was never in doubt. The French Canadian peasants who took the field were defeated at Saint Charles and Saint Eustache, and in Upper Canada the appeal to force collapsed after a farcical skirmish at Montgomery's Tavern, near Toronto. In 1838 fresh disturbances occurred at a few places in Lower Canada, only to be repressed with a promptness which showed the futility of further resistance. Apart from the domestic bitterness occasioned by these outbreaks, they were the cause of a diplomatic crisis, in that the activity of Mackenzie's American sympathizers led to strained relations between Great Britain and the United States. The burning of the *Caroline* (q.v.) and the fight at Pelee Island (q.v.) were international episodes of the first importance.

The best fruit of the rebellion was Lord Durham's report and the transformation of British colonial methods which followed it. In 1838 the Earl of Durham (see DURHAM, J. G. L., EARL OF) was sent to Canada as governor-general and given a commission to investigate the state of the country. The bluebook in which he described the causes of the rebellion and suggested remedies for obvious evils is held, by common consent, to rank first among the documents of the Colonial Office. Whether the text was written by Durham or Charles Buller, or by both in conjunction with Gibbon Wakefield, the report as it stands is a classic in political literature. The two essential recommendations which it makes are that responsible government be freely conceded and that the provinces of Upper and Lower Canada be reunited with a view of allaying the racial discord which had raged so fiercely in Quebec under the Constitutional Act. The Union Act of 1840 was the immediate sequel of Lord Durham's proposals and a first step toward the political consolidation of British North America. The salient feature of this constitution may be defined as the transfer of political power to an assembly which was chosen on a very democratic basis, though not by universal suffrage. The legislative council, with members appointed by the Crown, was retained, but real authority centred in the popular branch of the legislature. To the assembly each province contributed 42 members and it was provided that a general election should be held every four years, subject to the chance of a dissolution by the governor-general during the interval. The Union Act had imperfections and inconveniences which finally furnished a strong argument in favor of confederation, but under it (1840-67) Canada gained a political training which was invaluable and escaped from the worst of the anomalies that had provoked the rebellion. At first the act seemed to favor the English, inasmuch as French ceased to be an official language; but in 1848 it was restored to its former position of parity. With the establishment of democratic principles the party system reached a maturity which before had been unknown in Canada. Lafontaine (see LAFONTAINE, SIR LOUIS H.), Baldwin (see BALDWIN, ROBERT), McNab (see MCNAB, SIR ALAN N.), Macdonald (see MACDONALD, SIR JOHN A.), Brown (see BROWN, GEORGE), Cartier (see CARTIER, SIR GEORGE E.), and many other accomplished politicians found free scope for their talents in the ranks of Reformers or Conservatives. Much of the legislation which marks this period (for example, the abolition of seigniorial tenure in 1854) was designed to adjust the life of Canada to modern conditions, even at the cost of parting with a picturesque institution or discarding an ancient view of the relations which should subsist between church and state. The Reformers, however, had no exclusive possession of the liberal spirit, for it was a Conservative administration which abolished the clergy reserves. Education in both provinces began to receive an amount of attention which had not been paid to it hitherto. Judged also by economic results the progress of Canada under the Union Act was extremely satisfactory.

As the confederation movement is considered separately (see the article on THE CONFEDERATION), it will be unnecessary to discuss here the causes which suggested to Canadians a larger political conception than is represented by the Union Act. But in conclusion some reference should be made to the progress of Canada as affected by its relations with England on the one hand and with the United States on the other. From 1840 onwards the country enjoyed self-government in all matters of a local or domestic character, but it remained a colony and never considered itself to be a co-ordinate part of the British empire. In the second quarter of the 19th century the fixed belief of English ministers was that colonies are a kind of fruit which drops off the parent tree when it has become ripe. The rebellion of 1837 coming when liberal principles were triumphant in the mother country prompted the adoption of a generous colonial policy which has never been abandoned, but its effect upon the rise of imperial sentiment was only indirect. Yet notwithstanding the absence of a full partnership between Canada and England, the loyalty of the colony was signally illustrated during the first century of British rule. Despite friction between races, the pressure of foreign invasion and the existence of political privilege in both provinces, the attachment of an overwhelming majority of the population to British institutions and the British connection remained firm even throughout the decade that preceded the rebellion. The division which the American Revolution created between the United States and British North America could not fail to affect the fortunes of Canada in the most vital manner. Apart from the importance of the Loyalist immigration, the rise of a new and powerful state on the southern frontier brought into being conditions which thenceforth could never be ignored. As early as 1775 a small but active minority would have preferred membership in the band of revolted colonies, and ever since there have been individual advocates of annexation. But this propaganda has never spread widely or gone beyond the theoretical stage. In addition to the War of 1812 and the irritation caused by the filibustering raids of 1838, the question of boundaries was for long periods together unpleasantly prominent. The Webster-Ashburton Treaty of 1842, though it was received with great dissatisfaction in New Brunswick and Quebec, did good rather than harm by settling an irritating dispute. The Reciprocity Treaty of 1854, which was largely due to the efforts of Lord Elgin, brought the two countries into more direct contact than ever before, promoted friendly intercourse and was a source of prosperity to Canada during the 13 years of its existence (1854–67). Its repeal by the United States was in large measure due to a resentment which had arisen from Great Britain's attitude during the American Civil War. The fact remains that in its birth year the Dominion of Canada was excluded, by action not its own, from reciprocity in natural products with the United States. See the articles UNDER FRENCH RULE; THE CLERGY RESERVES; SEIGNIORIAL TENURE.

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7. THE MARITIME PROVINCES TO CONFEDERATION. The early history of the three eastern seaboard provinces of Canada is an important incident in the long dramatic struggle between France and England for world-empire. Their place on the map linked their destinies with those of New France on the one hand, and of New England on the other. The tale of their settlement and organization into communities is part of a greater story, the overflow of European peoples into the New World. They have been profoundly affected by great events outside their borders, European wars and political changes on this continent; and if they have not as yet reacted on the history of the world, as a nation they are young; their history is yet to make.

Nova Scotia.— In 1604, Sieur de Monts, a Huguenot gentleman adventurer and trusted soldier of Henry IV, made a voyage to the great Atlantic peninsula, which is now called Nova Scotia (q.v.). He was to found a colony in return for his broad patent to trade in furs. After exploring the rugged eastern and southern coast-line, he discovered the beautiful Annapolis Basin, and wintered, suffering terribly, on the island of Saint Croix. The next year, after searching as far south as Cape Cod for a suitable place, he turned back to the Annapolis Basin, and planted his colony on its shores, naming the cluster of huts Port Royal. The colony did not flourish, and, in 1613, it was destroyed by a force under Argall from the newly-founded colony of Virginia.

The French name for the country was Acadie, a musical native word, often mistaken for Arcady. It means "abounding in," as in Shubenacadie, and covered an ill-defined tract of wilderness, comprising what is now Nova Scotia, New Brunswick (q.v.) and part of Maine. In 1621, this territory was granted by James I to Sir William Alexander (q.v.), a Scottish gentleman, to be colonized on a plan distinctly mediæval. Alexander was to parcel out his province in "baronies," six miles long by three deep, to gentlemen, who were to "plant" them with settlers. Each baronet was to have almost regal powers within his own domain, even striking his own coinage, and "repledging" criminals from the King's courts of law to his own. The colony was to be a new Scotland, even by a legal fiction, part of the county of Edinburgh. One small settlement was actually made on the Annapolis Basin in 1629, but it came to nothing, and the whole province was handed back to France in 1632, by the treaty of Saint Germain-en-Laye. Still, to this day, the baronets of Nova Scotia form a distinct order in the British aristocracy, and the provincial flag bears the azure saltire of Sir William Alexander and the ruddy lion of Scotland ramping in gold.

For 22 years, the French had undisputed

possession, and succeeded in planting a colony on the feudal pattern, as far removed as possible in principle from republican New England. The government was military and paternal; the land was held by seigniors and tilled by a docile tenantry. The *habitants* were chiefly unlettered peasants from the country about Rochelle. In Acadie, they found broad marsh lands beside tidal waters, resembling the country they had left. Here they settled, built long dykes of logs and earth on the river banks, and peacefully cultivated the rich fields the salt tides fertilized. Population grew slowly. In 1671, there were 378 persons in the colony; in 1683, 600, chiefly about Port Royal. An interesting census of Acadie was made in 1686 by de Meulles, intendant of New France, who visited the scattered settlements and numbered the families, acres of cleared ground, boys, girls, fusils, horned cattle, swine and sheep in each. The population had grown to 915, including 30 soldiers at Port Royal. Although thickest about the seat of government, the Acadians had spread along the coasts and so far as Beaubassin at the head of the Bay of Fundy. They were a race of husbandmen, growing wheat, pease and rye and raising cattle, sheep, swine and poultry; they also built small boats for the shore fisheries. An observer relates that when the manure-heaps beside their barns grew unmanageable, they moved the barns. Few women came with the first settlers, who married with the Indians, and always lived on friendly terms with them. Priests of the Sulpicians and Missions-Etrangères were their trusted guides both before and after the English conquest. See article ACADIAN REFUGEES.

Throughout this period, the chief interest lies in the shifting fortunes of one family. Claude de St. Etienne, Sieur de la Tour, a ruined Huguenot gentleman of Champagne came out early in the 17th century, with his son, Charles Amador, a boy of 14, to better himself in the new colony. After Argall's raid, the two lived for years like Indians among the Indians. Their stronghold was Fort Saint Louis at Cape Sable, on the inlet now known as Port Latour. In 1627, Charles petitioned Louis XIII to be made commander of the coasts of Acadie, and his father took the petition to the French Court. On his return voyage the next year, he was captured by Kirk's fleet and taken prisoner to England. Here he became a friend of Sir William Alexander, married a maid of honor to Queen Henrietta Maria and was made a baronet of Nova Scotia, as well as his son, with large grants of land to support their titles. With two men-of-war, he came back to Cape Sable, where Charles held the one solitary post for France in Acadie. By persuasion, and at last by force, he strove to win his son over. Failing in both, he begged permission to live in Acadie, rather than return to England in shame, or to France and lose his head. This Charles granted, and Claude with his bride, his effects, two valets and two *femmes de chambre* disembarked. In 1635 Denys the historian found them living there in comfort.

Louis XIII rewarded Charles' loyalty by making him his lieutenant-general in Acadie. In 1632, Isaac de Razilly took possession of the province in the name of France; his chief officers were La Tour the younger and D'Aulnay Charnizay. On the death of de Razilly in 1636, the territory was divided between the two; La Tour established himself in baronial state at the mouth of the Saint John, with his Huguenot bride, while D'Aulnay made Port Royal, across the bay, his headquarters. D'Aulnay intrigued against his rival at the court of France and procured his recall to answer charges of fraud upon de Biencourt, his former commander. La Tour refused to go to France, and tried to enlist the Puritans of Boston on his side. Failing them, he obtained help from Rochelle; the «proud city of the waters» sent him supplies, munitions of war and 140 soldiers in the *Clement*. When the *Clement* arrived in the spring of 1643, she found Fort Saint John closely beset by D'Aulnay and 500 men. Being closely pressed, La Tour and his devoted wife slipped through the blockade by night, reached Boston safely, returned with reinforcements and drove D'Aulnay back to Port Royal. But D'Aulnay's hate was not easily tired. He went to France to raise another force against his enemy. At the same time, Madame La Tour went to Rochelle, to gather aid for her husband. D'Aulnay heard of her presence there and tried to have her arrested, but she escaped to England. On her return voyage, she almost fell into his hands a second time, but at last she reached Saint John again in safety. In April 1645 D'Aulnay besieged her here, while La Tour was in Boston. After a gallant defense, the fort was taken by treachery. D'Aulnay, to his everlasting shame, broke the terms of surrender, hanged the garrison and forced Madame La Tour to witness the death-struggles of her faithful soldiers, with a rope about her neck. Three weeks later, the heroine died of a broken heart. La Tour became a wanderer on the face of the earth, exploring and border-fighting in New France, while his rival ruled his province unchecked and built it up with a strong hand until he was drowned in the Annapolis River in 1650. La Tour hastened to France, confuted the old charges against him and obtained his former possessions in Acadie. Returning he married the widow of D'Aulnay and seemed about to enjoy a period of prosperity, when the province was once more taken by a Cromwellian fleet, in 1654. Undismayed by the sudden change of fortune, La Tour sailed for England and secured a joint grant of the territory with two English colonels, Crowne and Temple, to whom he soon sold out his interests. At the Restoration he was made a baronet of Nova Scotia, and closed his chequered and adventurous career in 1672.

In 1667 Acadie was again restored to France by the Treaty of Breda. The story of the French administration is not a pleasant one. It is a tale of incompetence, corruption, pettiness and is told at length in the pages of Parkman. The priests accuse the officials, the officials accuse the priests. The luckless colony was raided time and again by pirates, and by expeditions from New England to avenge the Haverhill and Deerfield massacres. Canada could only be reached by long and dangerous traverse of the wilderness, but Acadie was only a few days' sail from Boston.

French rule came to an end during Marlborough's wars. In September 1710 a force from Boston, chiefly of provincial troops, under

Col. Francis Nicholson, took Port Royal after a brief but gallant defense by Subercase. Port Royal at once became Annapolis Royal, in honor of the reigning sovereign, but it was not until 1713, by the Treaty of Utrecht (q.v.), and sorely against the will of Louis XIV, that Acadie became finally a part of the British Empire.

From 1710 to 1749 a small British garrison at Annapolis Royal held the province tenaciously for England. The fort, though well placed, and a Vauban plan, was ruinous; the earthen walls were always crumbling into breaches; the gun-carriages would not bear the guns; the barracks were roofless; for years the men were without bedding, stockings, great-coats or medicines. Supply-ships from England came once a year and brought provisions for nine months instead of 12. The hostile population would not take New England money for their corn and cattle; the home authorities would not honor the governor's drafts; the Boston merchants refused credit. During Walpole's long peace England seemed to forget the lonely garrison, while the French priests were agents of the French government, undermining English authority. From 1720 on, Louisburg, the new French city on the island of Cape Breton, was yearly growing in power, millions of livres were spent on its defenses, for France was bound to win back her lost province. All the time, convinced of its importance to the empire, one discouraged English governor after another held doggedly to his post.

The government was military, not civil, for the Acadians being Roman Catholics were, by the laws of England, incapable of voting; but at least one official regretted that they could not be given representation. They were governed by their deputies, the "ancientest" and most reputable men of each parish, chosen every year on or about 11 October. These were responsible for the good behavior of their districts and for the execution of orders transmitted by the governor-in-council. Philipps, colonel of the 20th regiment, was governor for almost this entire period. He visited the province twice, but resided mainly in London, while lieutenant-governors, chiefly regimental officers, Armstrong, Cosby, Mascarene, administered the colony. The governor was supreme; but to assist him, he had a small council, whose functions were advisory and executive. These officials did their best to advance British interests, giving the litigious Acadians justice in their endless disputes, and making wise suggestions for the improvement of the colony, which must have been doomed to gather dust in the Duke of Newcastle's closet of unopened dispatches.

On the outbreak of the War of the Spanish Succession (see SUCCESSION WARS) the men of Massachusetts rose and by splendid audacity struck down the stronghold of French power, Louisburg; but that glorious adventure belongs to the annals of New England rather than of Nova Scotia. In the summer of 1744, gallant old Mascarene sustained two hot sieges in his ramshackle fort of Annapolis Royal; the first force was led by young Belleisle and other Acadians; the second, by Du Vivier, a descendant of Charles de la Tour. In 1746, Ramezay encamped against him, awaiting D'Anville's armada, but did not fight. The same winter, he surprised Noble's force at Grand Pré, and killed, wounded or took prisoner nearly 200 men.

When the war ended by the Treaty of Aix-la-Chapelle in 1748, Cape Breton was restored to France, and Louisburg, the Dunkirk of America, resumed its old attitude of menace to the very life of the English colonies. Then at last sluggish England moved to save the key to her possessions over-sea. Nova Scotia was to have an effective garrison to counter-check Louisburg. In June 1749 a fleet of 13 transports, bearing some 3,000 colonists, and escorted by the sloop-of-war, *Sphinx*, reached the great three-fold harbor of Chebucto, long known for its excellence to French and English mariners. The leader of the expedition was Col. Edward Cornwallis, twin brother of the gay archbishop of Canterbury, and uncle of the Lord Cornwallis, who surrendered at Yorktown. He had seen service at Fontenoy and Preston Pans, and although his military reputation was afterward clouded by his share in the Rochefort and Minorca fiascos, he did his work as a city-builder well. The new military post, Halifax (q.v.), was quickly laid out, the land cleared, the population organized into a militia and a rough line of stockade and block-house run around the streets of tents and log-huts. In spite of the character of the settlers, trade-fallen soldiers and sailors, and the plague that carried them off in hundreds; in spite of Indian massacres, opposition from local smugglers, extortions of Boston merchants, discouragements from the home government, Cornwallis made Halifax a place on the map of the world. The founding of Halifax brought about the second capture of Louisburg, leaving the way free for Quebec (q.v.) and the downfall of the French power in America. Emigrants from Old and New England flocked to the new city. In 1750 and again in 1752, some hundreds of settlers came from the Palatinate. After a brief stay in Halifax, they were transferred to the island-studded bay of the La Hêve, the old headquarters of de Razilly, where they have grown into a race of hardy fishermen, whose town, Lunenburg, is the Gloucester of Canada.

In 1752, Cornwallis returned to England crippled by rheumatism, but his successors, Hopson and Lawrence, built strongly on the foundation he had laid. Their great problem was the growth of French power in the fortress of Louisburg and in the Acadian population. Under English rule, the *habitants* were far happier than under their old masters. The nominal government at Annapolis Royal had been powerless for good or evil. Its authority did not extend beyond a cannon-shot from the walls of Fort Anne. It was precisely under English rule that the Acadians increased and multiplied and, beginning to press upon the means of subsistence, spread outward, round the Bay of Fundy, to the marsh-lands on the further shore. Their law-suits were nearly always over disputed lands, or boundaries. In 1755, they numbered about 10,000 persons. England and France were then mustering all their forces for the coming struggle known to history as the Seven Years' War. No one could foretell that it would be final or which country would win. England seemed to be at the lowest ebb of fortune and spirit. Brown's lugubrious *Esti-*

mate predicted her immediate downfall. France seemed strong in the New World; she had hemmed the disunited English colonies in with a chain of posts from the mouth of the Mississippi to Louisburg. She had never ceased to regret the loss of Acadie or to plan for its recovery. The province was the pivot of the whole situation in the east. In these circumstances, the presence of the alien French population in it constituted a grave danger. The claim has been set up that they were neutrals; they had this idea themselves; but this strange notion was simply due to the impotence of the British government. They were no more neutrals than the people of Alsace and Lorraine were after their transfer to Germany in 1871. They were British subjects by conquest, by treaty, by the formal taking of an oath of allegiance and by the common law of nations, but they refused to consider themselves as such. They might be French subjects again by another war, or the return of the Pretender. Whether they left the province or remained in it was not a matter of indifference. If they stayed, they afforded a shield to hostile operations; if they were free to go, they would strengthen and feed the garrison of Louisburg. In this dilemma, the old proposal of Shirley's was renewed, their deportation. In the autumn of 1755, after Braddock's defeat gave the signal for war, this was done. The idea originated in New England and was carried out by New England men, acting under the orders of Governor Lawrence. At Grand Pré, Pisiquid, Chignecto and Annapolis Royal, the men were called together and made prisoners, and placed on board the transports; their families followed them. The embarkation consumed long weeks. Finally the ships sailed and distributed the unhappy people among the Atlantic colonies. In all, some 7,000 persons were in this way removed from the province. Opinions differ as to the measure. The French theory is the natural brutality of the English; one writer finds his reason for it in the greed of Lawrence to seize on the belongings of the poor peasantry. The general English view is that it was a war measure, cruel as all war is, but imperative for self-preservation; and this theory has the support of Parkman.

With the deportation of the Acadians came peace with the Indians. In 1761, Argimoosh, "the great witch," and his braves buried the hatchet in Halifax and washed the war paint from their bodies. Now for the first time settlers were safe outside the pickets of the city; and the country began to fill up. Emigrants from Connecticut occupied the waste lands of the Acadians. Highlanders from Caithness and the Western Isles settled about Pictou harbor. Presbyterians from the north of Ireland found homes in Colchester. Before and after the Revolutionary War, thousands of devoted Loyalists came to the province, some to remain, some to pass on. Shelburne, a city of these exiles, numbering 10,000 at one time, passed away like a gipsy encampment. The long wars of peace began with countless inroads upon the wilderness. In a century the Acadians had scarcely cleared 300 acres. Now farms and settlements were eating into the forest, and hamlets were springing up beside the empty harbors. Before the end of the century, the great industries of shipbuilding and the fishery were in their vigorous infancy. The American Revolution left few marks on the history of the province: efforts were made to bring the colony into revolt with the rest; one daring man planned the capture of Halifax, and some sympathizers with the rebels were tried for treason. There was even something like a tea riot in Halifax; but the conservative forces held the province firm. Halifax prospered, as it always did in war-times, through supplying the army and navy, and the sale of the many prizes brought to port. With the return of peace, the tide of prosperity promptly ebbed. In three great wars since its founding, Halifax was a nest of privateers, which brought large returns to their owners.

Colonial government was at first military. All power was vested in one man, the governor, or his lieutenant-governor, who was usually a soldier. To advise him, he had a council, and his instructions contemplated a legislative assembly. As the Acadians were incapable of representative institutions, they were governed through their deputies. Members of the old council were sworn into the new one by Cornwallis, when Halifax became the seat of government. His large instructions empowered him to summon assemblies and make laws; but the first assembly was not elected until 1758. From this time, the chief power passed from the governor to the council, a small côterie of Halifax officials and merchants, appointed for life, who sat in secret session and were not responsible to the people. The powers of the assembly were curiously limited, and friction between the two bodies was constant. Governor succeeded governor, almost always an army officer with high Tory views of prerogative and military conceptions of his office. He was gently guided through his unfamiliar civic part by permanent officials in the council like Richard Bulkeley, who came out as aide to Cornwallis and died provincial secretary in 1800. The tone of society as well as government was conservative, not to say reactionary. This state of things lasted until well into the fourth decade of the 19th century. With its large military and naval population, and the merchants who lived by supplying them, Halifax was in many respects an English garrison town in America. In the first session of the House of Assembly, the Church of England was established by law; the first college was modeled on Oxford, and its statutes required subscription to the Thirty-nine Articles both at matriculation and on taking a degree.

The agitation for reform began outside, for the country was pitted against the city. Jotham Blanchard, editor of the *Colonial Patriot,* was perhaps the first critic of the existing order. The Rev. T. McCulloch, the Scottish "Seceder" missionary, who founded Pictou Academy and became the first president of Dalhousie College (q.v.), was another early reformer. But the man who brought reform to pass was Joseph Howe (q.v.), Nova Scotia's darling son, perhaps the most interesting personality in Canadian history. He was born at Halifax in 1804 of Loyalist stock. His father was King's printer, and, after some scanty schooling, he was apprenticed to his father's trade. In 1835 he was editor and owner of the *Nova Scotian* newspaper. On New Year's day it contained a letter signed "The People," accusing the Halifax magistrates, in plain terms, of pocketing public money. Their indignation was extreme and they began a libel suit against the daring editor. If truth is libel, Howe had no case; and no lawyer would undertake it. Howe conducted his own defense, and by a brilliant address to the jury secured a triumphant acquittal. From that hour he was the idol of the people, whose cause he had espoused. On the other hand, several hot upholders of the existing order challenged him; he fought one duel, and, having proved his courage, wisely declined further argument by pistol. Howe was a good example of the popular tribune, emotional, eloquent, social, with the faults of such a nature, but possessing tact withal and the statesman's insight into great problems far beyond the ken of provincial politicians. On such questions as the union of the remaining British American colonies, communication between them, the federation of the empire, Howe was far in advance of his time, and his ideas were formative. Henceforth, his career was in politics, rather than in journalism. Elected member for Halifax in 1836, he at once attacked existing abuses in a series of resolutions, which served chiefly as a program of reform. Soon afterward he began an important correspondence with Lord John Russell, the colonial secretary, on the difficulties of local government. As a result, the latter instructed Sir Colin Campbell, the governor, to introduce certain of the changes suggested by Howe. This Sir Colin refused to do, and Howe began an agitation which led to his recall. He was succeeded by Lord Falkland, whose remedy for the trouble was coalition in the council. Four of the old council were dismissed, and four Liberals, Howe among them, took their place. But the two interests were irreconcilable: Howe and his friends soon resigned, and began to lay before the people the evils of the irresponsible system. In the election of 1847 Howe and his party swept the country. The new assembly passed a vote of want of confidence in the council, which thereupon resigned in disgust. A cabinet was formed of the triumphant Liberals and the principle of responsible government was established.

The situation of the colonies remaining to Britain on this continent in the first half of the 19th century was not cheering. Upper Canada was largely virgin forest, with struggling towns and widening clearings: Lower Canada was alien in speech and religion; both passed through the throes of rebellion. The great West was supposed to be uninhabitable. The provinces by the sea were poor, thinly settled, each with its own government and its own tariff wall against the rest. The 20th century dawns on a united and prosperous country stretching from the Atlantic to the Pacific. For years Howe pointed out the value of union, for the object lesson of the Great Republic was hard to mistake. But here, as in the case of the 13 colonies, before and after they achieved their independence, each province had its own pride, interests and jealousies. Besides these, the geographical barriers to union seemed insurmountable; but the locomotive engine changed the face of affairs and provided the solution of the problem. The universal fever for building railways reached the provinces. The first railway in Nova Scotia united Windsor, Halifax and Truro; the first in New Brunswick, Saint John and Shediac. A bolder idea was to join the provinces, inland and seaboard, by an intercolonial railway. If united for commerce, why should not the colonies be united for government?

It cannot be said that anywhere in the Maritime Provinces was there a popular movement in favor of union. It was the thought of a few strong, far-seeing men, with powers of persuasion, like Macdonald in the West and Howe in the East. Nova Scotia has the honor of leadership in bringing about the Charlottetown conference. When the question came up in 1867, Howe was in opposition, and Tupper carried the resolution through the House. By a curious irony of fate, Howe was now led to combat the very measures he had fought for so long. He took advantage of his opponent's failure to submit such an important measure to the verdict of a popular election and he roused the people into fury against confederation. They were bought and sold, he told them, «for 80 cents a head, the price of a sheepskin.» In the next election, the great issue was repeal of the union, Howe carried the country, and Tupper was the only conservative returned. Howe tried every legal means to detach his province from the union, but the British government refused to reconsider the measure it had just sanctioned, and Howe would not appeal to Washington, or have recourse to arms. He sought «better terms» for his province from the Dominion government, and entered the Macdonald ministry to assist in working out the problems of the new experiment in government. Though not a consistent, Howe was a great man; with all his faults, he loved Nova Scotia well, and Nova Scotia will long cherish his memory.

New Brunswick.— The waterway of the Saint John as a greater Indian road, attracted the attention of the French fur traders early in the 17th century. La Tour fixed his headquarters at its mouth. It is still the main artery of the province. There were also French settlements on the rivers and harbors, such as the Miramichi, the Restigouche, Baie Verte. Petite Rochelle was partly fortified; the town at Beaubien's Point had 200 houses and a chapel. These settlements were not permanent. There was a small colony from Massachusetts at Maugerville on the Saint John in 1760; but the history of New Brunswick as a political unity begins with the close of the American Revolutionary War.

In some respects, the struggle of the 13 colonies for independence was a civil war: for all the colonists were not of the same mind. Some of the best regiments on the King's side were raised in America. For instance, Fanning, the second governor of Prince Edward Island, at one time judge of the Supreme Court of North Carolina, raised and commanded «The King's American Regiment.» When the British cause was lost, such forces were disbanded, and the citizen soldiers, impoverished by eight years of war, could not or would not live under the new government. Many of the official class, the Episcopal clergy and their humble followers were also on the losing side. For the defeated, there was no mercy; the fierce republicans would not let them live in the country. After the surrender at Yorktown (q.v.) thousands of these unfortunates flocked to New York and other seaports. No provision was made for them in the terms of peace; but public sympathy was aroused on their behalf, the British Parliament took generous measures for their relief, Sir Guy Carleton stood their friend. Ships were provided to carry them away, large grants of land were made to them in the loyal colonies, with tools, supplies and provisions for one, two, or three years. Some went to England, but the great majority found homes in the northern wildernesses. There some 30,000 exiles, many of the educated and cultured classes, found refuge. In American history these are the Tories, traitors to their country; in Canadian history, they are the United Empire Loyalists, the makers of the new Dominion. More than any other class of emigrants, they formed present Canadian sentiment and institutions.

The great emigration took place in 1783. On 18 May a fleet of 19 transports, with some 3,000 Loyalists on board, reached the mouth of the Saint John. Here a great stream of 450 miles pours through a narrow breach in the rocks into a small harbor, where the flood-tide rises 26 feet, and ebb leaves the great ships aground. All round are desolate hills masking the fertile region beyond. This unpromising site the Loyalists chose for their city. They were men of the 8th, 98th, 194th regiments, the New Jersey Volunteers, and the Queen's Rangers. The grantees' list show good substantial English names. The «fall fleet» brought 1,200 more, and Parrtown, so called in honor of Governor Parr, of Nova Scotia, began its career with a population of 5,000. Politically, it was situated in Sunbury County, Nova Scotia. Soon the Loyalists showed active discontent at Governor Parr's delay in making out their grants, and in giving them representation in the House of Assembly and, in spite of his opposition, they succeeded in persuading the British government to erect their county into a separate province with a royal governor, council and House of Assembly of their own. This was done in 1784, and the province of New Brunswick was created by royal charter, with Col. Thomas Carleton, brother of the famous Sir Guy Carleton (q.v.) for governor. His commission and instructions were practically the same as those given to Cornwallis in 1749. This council of 12 members exercised both executive and legislative functions. The first House of Assembly, of 26 members, was elected, not without riot, in 1785, and met for the first time in the following January. In this year, Parrtown was incorporated as Saint John (q.v.); it was the first city in British America to receive a charter. It is modeled on the charter of New York, and gives the mayor the office of garbling spices and the right to appoint the bearer of the great beam. No emigrant or other person could sell goods without first obtaining the freedom of the city. From the founding of the province until 1832, no changes were made in the constitution. As in Nova Scotia, the prevailing ideas were high Tory; and popular rights received little attention.

New Brunswick's chief wealth is her great forests; and her two chief industries, lumbering and ship-building, soon sprang up: but agriculture languished. Population followed the waterways, the natural timber roads from the interior. Down to the time of the Crimean War, the timber trade was fostered by British legislation. The province grew, but not steadily; periods of prosperity were followed by periods of depression. Many emigrants brought out by the timber-ships simply passed through to the United States. The Reciprocity Treaty of 1852 was a boon to the Maritime Provinces: its abrogation injured trade.

During the War of 1812, the provinces were harried by privateers; but they were not invaded, like Upper Canada, because New England was opposed to the war. In the provincial sea-ports privateering also throve. Dalhousie College was founded with customs money taken at Castine by an expedition from Halifax. After 1815, settlers from the United States began to occupy disputed territory between New Brunswick and Maine. The boundary between the two, left vague by the treaty of 1783 almost led to war. The northwest line was to run due north from the source of the Saint Croix River to the height of land between the Saint Lawrence and the Atlantic. Instead of one chain of high lands, there are two chains: between them lay the disputed territory, comprising some 12,000 square miles. Under the Jay treaty of 1794, a commission was appointed to determine the line. The Americans wished to extend the due-north line to the Métis River in Quebec: the British wished to make Mars Hill the limit, and they could not agree. Another attempt at settlement was made by the Treaty of Ghent. The King of the Netherlands was appointed arbitrator, but his award was not accepted. In 1839, the difficulty became acute. Some lumber-thieves cut timber on the debatable land; the governor of Maine sent a sheriff and posse to drive them out, and New Brunswick lumbermen resisted the officers of the law. The squabble roused intense feeling on both sides. The governor of Maine called for 10,000 troops to guard the State's rights. The governor of New Brunswick, Sir John Harvey, sent two line regiments with artillery and volunteers to the scene of action. Nova Scotia voted all her militia and £100,000 to aid the sister colony; the Canadas also proffered help. Gen. Winfield Scott took command of the American forces. He and Sir John Harvey had fought against each other in the War of 1812. They agreed to a joint occupation of the disputed territory; and the war-cloud blew by. In 1842, Mr. Baring for England, and Webster for the United States, negotiated a treaty that at last delimited the frontier. On the disputed territory, Maine got 7,000 and New Brunswick 5,000 square miles. Mr. Baring was made Lord Ashburton for his success, and the treaty is known by his title.

One peculiarity of the colonial status was the appointment of colonial officials by the home government. New Brunswick's case is typical. The governor, the attorney-general, the provincial secretary, the judiciary, the customs and Crown land officials were all appointed from England and paid out of the revenues arising from the customs and Crown lands. In 1825, the Legislature was given control of the customs, when it soon discovered that nearly all the revenue went out in salaries. Not until 1848 did the province both receive the revenues and fix the salaries of this department. In 1837, the province took over the revenue arising from the Crown lands on condition of paying the governor, the judiciary and the other government officials. The last department to come under provincial control was the post office.

As in other colonies, the irresponsible council became an abuse, and many were the contests between it and the assembly. In 1832, a second council was established with executive, but not legislative functions. This was done by the home government in its desire for uniformity in the colonial governments; but the parliamentary principle of majority rule with an executive council or cabinet to carry out the will of the majority were slow in being understood. It was six years later before the executive included a member of the elected assembly. Slowly the province worked out the problem of self-government. In 1839, when Sir John Harvey read to his legislature, Lord John Russell's despatch on tenure of office, and unlike the governor or Nova Scotia was in accord with its proposals, the assembly, after full debate, actually refused the boon of responsible government. In 1848, however, the modern system was in essential particulars recognized by formal resolution. Charles Fisher, and L. A. Wilmot, afterward judge and lieutenant-governor, were the leading reformers, and two of the royal governors, Sir Howard Douglas and Sir John Harvey, were in complete sympathy with the popular movement.

New Brunswick was represented at the Charlottetown conference, where the preliminaries of confederation were discussed. At the Quebec conference, the leading men of the opposition as well as of the party in power were delegates. The 72 resolutions then agreed upon were to be submitted to the various legislatures for their approval. Before the New Brunswick assembly could vote on them, it was dissolved; and in the new House, a large majority were pledged to oppose them. This led Nova Scotia to withhold the resolutions, as no vital union could be effected with the upper provinces that left out New Brunswick. However, when the House opened in 1866, the majority committed themselves to the policy of union in the speech from the throne. The House dissolved on the issue, and, sentiment having changed, in the new election, the unionists were returned by a large majority. New Brunswick is one of the four original members of confederation. See article CONFEDERATION; also NEW BRUNSWICK.

Prince Edward Island.— The large crescent-shaped island in the southern part of the Gulf of Saint Lawrence is supposed to have been discovered by Cabot, and afterward by Cartier, who named it Isle Saint Jean. After the conquest, it was still called Saint John's Island until 1780, when the local legislature named it New Ireland, an act disallowed by the British government. In 1794, it was renamed Prince Edward's Island in compliment to the Duke of Kent, the father of Queen Victoria. After the Treaty of Utrecht, Acadians from the main land settled at the southern central harbor and named it Port La Joie, the present Charlottetown. It was governed from Louisbourg. In 1752 the population was 1,354. Three years later, after the fall of Beauséjour and the expulsion of the Acadians, many took refuge there. At the fall of Louisbourg in 1758, the population was at least 4,000 souls, in four thriving parishes. The fertile "Garden of the Gulf," as the islanders love to call their little sea-girt province, was even then worthy of the name. Casgrain calls it a second Acadie: for hence also the Acadians were expelled. When Captain Holland made his survey in 1764, he found only 30 Acadian families "on the footing of prisoners," and a tiny British garrison in a miserable fort.

In 1763, the year of its cession to England, Lord Egmont proposed a plan of settlement worthy of Sir William Alexander in its feudal character. One feature was a chain of baronial castles from one end of the island to the other; but the plan was never carried out. In 1767, the entire island was divided into 67 lots or townships, of some 20,000 acres each, and granted, by lot, in one day to a number of influential Englishmen, on the old condition of settling so many emigrants within a certain time; they were to pay a perpetual quit-rent, or land-tax. Here began the curse of the absentee landlord, which laid the island under a blight for more than a century. At first, it was annexed to the government of Nova Scotia, but in 1768 it was, on the petition of a majority of the proprietors, erected into a separate province. In 1770, the first royal governor, Colonel Patterson, arrived with his official staff, whose salaries were to be paid from the quit-rents. The formative ideas here were also high Tory. Roman Catholics were not permitted to settle; no schoolmaster from England might teach without a license from the Bishop of London. Population grew slowly; for few of the proprietors fulfilled the conditions on which they got the land. In 1773, the first House of Assembly was elected. Its first act was to confirm all the past proceedings of the governor and the council.

On the outbreak of the Revolutionary War, two American vessels, sent to cruise in the Gulf for British ordnance store ships, raided Charlottetown and carried away some prominent officials. For this Washington cashiered the delinquent officers and released the prisoners with expressions of regret. Another raiding expedition from Machias came to nothing, and the island remained free from molestation till the close of the war. In 1781, proceedings were begun in the Supreme Court against the townships in arrears with quit-rents, and various holdings were escheated and sold, it was thought, without due notice to the landholders. The unimproved waste land was an obstacle to colonization; the owners neither planted settlers nor paid the quit-rents, on which the revenue depended. The landlords argued for the defense, that some of them were officers on active service, that the war had prevented settlement, and that the lands were sold to persons on the ground at absurdly low prices. In rebuttal, Patterson urged that in the midst of a disastrous war, both money and purchasers were scarce; the island might have been captured or ceded back to France. He admitted that he bought up escheated lands, but held he was within his rights as a citizen in doing so; he had also, at his own risk, saved out of the sales, various lots for the absentee owners. In response to various petitions from the proprietors, the home government granted them relief, and sent a draft bill to Governor Patterson, making the sales voidable. This he was to submit to the assembly, but he suppressed it for two years. A new assembly was elected in 1784. It resolved to complain to the King against the governor for disposing of the lands so hastily, when he dissolved it.

The war was now over; the exiled Loyalists were pouring into Nova Scotia, and Patterson hoped to divert the desirable stream of emigration into his own province. Many Loyalists came; by special favors he secured them to his interest, settled some of them on the lands sold in 1781, and in 1785, secured an assembly certain to support him. It passed an act approving his conduct in escheating the unimproved estates, but the home government disallowed the act and recalled the disobedient official. In 1786, the governor submitted at last the English Draft Act, already mentioned, to the assembly, which passed it with haste, as also another act of the governor's framing restoring the escheated lands to the rightful owners, but saddling them with heavy expenses; this the home government disallowed and dismissed the members of the council concerned in it.

The new governor, Edmund Fanning (q.v.) arrived in November, but Patterson refused to vacate his office, and the winter was spent in the quarrels of these two Kings of Brentford: but in the spring, Fanning was firmly established. The escheated lands remained in the quiet possession of their purchasers, some of whom came to terms with the original grantees. Fanning was a native of New York, a graduate of Yale, and a D.C.L. of Oxford. Through the Revolutionary War, he commanded the King's American Regiment and was twice wounded. In his administration, the land question smouldered. The chivalrous Earl of Selkirk, who also planted settlements in Upper Canada and the Northwest, brought out, in 1803, 800 of the Clan Ronald Macdonalds and settled them about Point Prim.

Fanning was succeeded by Des Barres, a Swiss officer in the British service, famous for his surveys, his amours and his great age; he jumped over a settle when he was more than a hundred years old. His administration was uneventful, but not so that of his successor. Charles Douglas Smith, brother of the famous Sir Sidney, who foiled Napoleon at Acre, was a fine example of the old-fashioned high Tory royal governor. His first address to the assembly, when it met in November 1813, was insolent and dictatorial. In the following January he prorogued it and did not convene it again until 1817. Between this and 1820 the legislature was three times assembled and dissolved, after short sessions, by this exponent of personal rule. His proceedings in regard to the quit-rents were also oppressive. In 1818, in opposition to the express commands of the home government, Smith enforced the payment of quit-rents in arrears. His action, however, the British government disallowed, and ordered part of the exactions to be refunded. Then, for three years, no attempt was made to collect the odious tax; in some instances payment was refused by the receiver-general. In 1823 another effort was made by the governor to enforce payment. The Gælic-speaking Highlanders of King's County were required to pay dues that seemed obsolete, or give promissory notes at 10 days. In the depth of winter, they must haul their farm produce to Charlottetown and sell at a sacrifice to meet these demands. Without a legislature, the people petitioned High Sheriff MacGregor to call public meetings for the discussion of grievances. The gathering at Charlottetown drew up an address to the King, rehearsing a long list of charges against the governor, and requesting his recall. Smith retorted by opening a libel suit in the Court of Chancery, over which he himself presided, against the committee on the King's address in Queen's County. His object was to prevent the petitions reaching England, but the custodian of them escaped to Nova Scotia. For merely publishing an account of the proceedings the editor of the local paper was brought into the Court of Chancery for libel. When he revealed the names of the writers they were admonished by the chancellor-governor in the vein of Judge Jeffreys. This energetic ruler, who shook his fist at the speaker of the assembly and gave him three minutes by the watch to adjourn the House, was recalled in 1824, when he had brought his long-suffering province to the verge of rebellion.

Governor succeeded governor; the island grew in population and prosperity; fisheries and husbandry throve; but the land question was an open sore. It had now become complicated by the fact that the original proprietors had died and bequeathed or had transferred their rights in the island. In 1859 Sir Samuel Cunard (q.v.), the Halifax merchant who founded the famous line of steamers bearing his name, proposed that the whole question be referred to a commission of three members, one to be appointed by the Crown, one by the island Assembly and one by the proprietors. To this all agreed. Howe was the nominee of the Assembly. The commission sat in the Colonial Building in Charlottetown, examined many witnesses, though not on oath, and heard counsel on behalf of both parties. They afterward visited the shire towns and acquired a vast amount of information on the difficulties. Their report is dated 18 July 1861. It condemns the original method of granting the island, commends the land purchase act, by which the Selkirk and Worrell estates had been acquired for the people, and considers some such system to be the solution of the vexatious problem. It recommends the British government to guarantee a loan of £100,000, which would enable the local government to enter the open market for the purchase of estates. But the home government refused the loan, and the landlords refused to be bound by the findings of the commission. The old difficulty remained until the island came into the Confederation in 1873, when the Dominion government placed $800,000 to the credit of the province for the purchase of estates and the local legislature made the sale of estates, on evaluation of commissioners, compulsory.

Charlottetown was the scene of the historic conference of delegates from the maritime provinces to discuss union, when the representatives of the Canadas came knocking at the door, but the islanders were not in favor of any change in their status. There was prejudice, the conception of a new nation was hard to grasp and the main issue was befogged by parish politics. Although islanders took part in the Quebec and London conferences also, the island remained outside Confederation until 1873, when the crippling of the provincial means by extensive railroad building led the people to a reconsideration of the matter. The Dominion government gave generous terms, and the little province, while losing nothing of autonomy, entered into a larger national life. See articles in this series on CONFEDERATION; SINCE CONFEDERATION; CONSTITUTION; AGRICULTURE; FISHERIES; MANUFACTURES; THE FORESTS AND LUMBER INDUSTRY; MINERALS; GEOGRAPHY; PRINCE EDWARD ISLAND.

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8. CONFEDERATION.

In 1837 there took place two rebellions: one in Upper and British, the other in Lower and French, Canada, simultaneous, but almost unconnected, and scarcely united in sympathy, since the British Protestants of the upper province were by no means fraternally linked with the French of the lower. In Upper Canada the rebellion was a rising of a democratic party, including many of the most recent colonists and some from the United States, against the personal rule of the imperial governor and the domination of a political circle nicknamed the Family Compact, and consisting largely of U. E. Loyalists, which monopolized public offices and emoluments. Its leader was Lyon Mackenzie, a man honest and right in his main aim, if responsible government is right, but wanting in wisdom and capacity as a leader. The object of the extreme wing was an independent republic or annexation to the United States. That of the less extreme wing was responsible government on the British model. The political crisis and the outbreak of civil war were brought on by the indiscretion of an inexperienced governor, Sir Francis Bond Head, who (1836–38) threw himself into the arms of the Family Compact and the Tory party. In Lower Canada the rebellion was a rising of the French, the conquered race, who formed the great majority, against the monopoly of office and power by the British and conquering race, exercised largely through a council appointed by the imperial governor. Its object was the assertion of French equality and right. It had been preceded by a series of angry controversies between the French patriots and the governor with his British councillors and the Colonial Office at their back. Both rebellions were quelled (1838) with ease and without much bloodshed; that in Upper Canada by the loyal militia, that in Lower Canada by the Queen's troops. There were few executions, but some of the leading insurgents were driven into exile. The constitution of Lower Canada was suspended, but that of Upper Canada was not.

The Liberal party in the mother country was now in the ascendant, having carried Parliamentary reform. It looked with sympathy on the struggle of the Canadians for free institutions. Lord Durham (q.v.), son-in-law of the Whig Prime Minister, Earl Grey, and though an aristocrat a strong Liberal, was sent out (1838) to study the situation. In a report of remarkable ability, which has been regarded almost as the gospel of colonial liberty, he decided in favor of extending to Canada responsible government on the British model, requiring the governor, instead of ruling personally, to be guided, like the British sovereign, by the advice of responsible ministers, who were to be designated by the choice of the people. The report at the same time recommended the reunion of the two provinces, a measure the sure result of which its author imagined to be the complete ascendency of the more powerful race, the destined heir, in his opinion, of the whole North American continent.

Durham, having exceeded the limits of his power, and incurred censure by condemning some ex-rebels to banishment of his own authority, his mission was cut short (1838) but his main recommendations were carried into effect (1839). The provinces were reunited, the measure being carried in the lower province, the constitution of which had been suspended by the fiat of the Crown; in the upper province, after some debate, by a vote of Parliament. Responsible government was introduced. The governor was instructed thenceforth to be guided, like the British sovereign, by the advice of his ministers, who were to be responsible to the people.

In a dispatch from Lord John Russell (q.v.) (5 Feb. 1841) the governor-general was instructed to call to his councils "those persons who, by their position and character, have obtained the general confidence and esteem of the inhabitants of the province," and "only to oppose the wishes of the Assembly when the honor of the Crown or the interest of the empire is deeply concerned." There soon followed a general amnesty, wih return of exiles, and Lyon Mackenzie sat in Parliament under the new régime.

About the same time, and by the action of the same general forces, including the ascendency of the Liberal party in Great Britain, responsible government on the same model was introduced in the maritime provinces. In Nova Scotia the change was brought about largely by the eloquence of the patriot leader Joseph Howe (q.v.) (1838).

The transition was smoothed by the wisdom of the new governor, Poulett Thompson, Lord Sydenham (1839–42), a man of business, trained in commercial life, who adapted himself steadily and with general success to the introduction and working of the new system. Sir Charles Bagot, who followed (1842–43), though a Conservative, took the same line. But the idea of colonial self-government had hardly taken root in the policy of the Colonial Office or in the minds of British statesmen. Sir Charles Metcalfe (1843–45), the next governor, had been trained in the imperial government of Hindustan, and brought with him the impression that in every dependency the governor was still personally supreme and responsible for the choice of his ministers and for their policy. Acting upon this principle, he attempted to form a ministry (1843) of his own without regard to party designation. A political storm, with furious pamphleteering and ministerial interregnum, were the results. The upshot was failure on the governor's part to form an effective ministry, and his consequent defeat. The Colonial Secretary, Lord Stanley, however, emphatically endorsed the governor's conduct, and was authorized with his own approbation to convey the personal approbation of the Queen.

The new system was finally installed and brought into order by Lord Elgin (q.v.) (1847–55), one of the best and wisest servants of the empire, who entered fully into the spirit of responsible government, contenting himself with the exercise of an informal influence, rendered important by his character and ability. He could even flatter himself that he did more in this way than he could have done with the formal powers of the governor. He came in, however, for the last of the storm. The Liberal party, now in power, passed an act called the Rebellion Losses Act (1849), indemnifying those who had suffered losses by the destruction of their property in the suppression of the rebellion. This the Tories regarded as the indemnification of the rebels. Their cry was taken up by the Tory party in Great Britain. Elgin gave his assent to the act, reluctantly it seems, in compliance with the rule which required him to be guided by the vote of Parliament and the advice of his responsible ministers. The Tories, now playing the part of insurgents in their turn, rose, burned the Parliament House at Montreal (1849), with its irreplaceable archives, and stoned the governor-general, who had a narrow escape from their fury. Elgin, however, remained firm and was supported by the home government. After this his reign, or rather his term, was peaceful and generally popular, though more popular with the Liberals than with the Tories. The triumph of the free trade policy in Great Britain, depriving Canada of her colonial privileges, while she remained fettered by the Navigation Laws and was excluded from the market of the United States, bred commercial depression and discontent. The consequence was a manifesto signed by leading commercial men and pointing to union with the American republic as a remedy in the last resort. To put an end to this movement by removing its cause, Lord Elgin went to Washington and negotiated a reciprocity treaty with the United States (1854). This, following the repeal of the Navigation Acts and the release of the Canadian trade from the fetters which they imposed, restored prosperity, allayed discontent and put an end to the desire of annexation.

After the Rebellion Losses Bill, the most hotly debated of the political questions was that of the secularization of the clergy reserves (1854) (see CANADA — CLERGY RESERVES), tracts of land, which, before the revolution of 1837, when the Church of England was established in Canada, had been set apart for the maintenance of the clergy of the state church. After a long struggle secularization was carried, and the state church, with its privileges, ceased to exist. King's College, Toronto, which, so far as the teaching staff was concerned, had, like Oxford and Cambridge, been Anglican, was turned into the University of Toronto (see TORONTO, UNIVERSITY OF), and thrown entirely open to all denominations. Under Bishop Strachan, the powerful Anglican leader of the day, high Anglicans seceded from the University of Toronto and founded the University of Trinity College (1852). Other churches, during the continuance of the exclusion, had obtained charters for universities of their own, and dissipation of resources not more than sufficient, if collected, to maintain one great university, was the result.

The abolition of the seigniories (1854) in French Canada (see article SEIGNIORIAL TENURE), relics of the old Bourbon regime, with the oppressive privileges of the seignior, was another change obviously demanded by the new order of things. It was accomplished peacefully, without violation of the rights of property, and with entire success. Another necessary change was the abolition of the aristocratic custom of primogeniture in succession to land, for which was substituted the democratic principle of equal partition, "gavel-kind," as the movers called it. The Tory party, sympathizing with aristocracy, faintly resisted the change. The progress of democracy was further marked by a change in the constitution of the Legislative Council which formed the Upper House of Parliament. Instead of being nominated by the Crown, as it had hitherto been, it was in 1856 made elective.

The party system of government was now in full play, but the principles and relations of parties were far from being definite or stable. There was a Tory party representing the U. E. Loyalists, and the traditions of the Family Compact under the leadership of Sir Allen MacNab, who opposed the secularization of the clergy reserves and the abolition of primogeniture. There were on the other side moderate Liberals under Baldwin and more advanced Liberals under Hincks. But the lines of political party were crossed and perplexed by the nationality of French Quebec. The French Catholics, instead of succumbing politically to British predominance as Durham had imagined that they would, closed their ranks, showed their force, played on the balance between the British parties and put a Frenchman, in the person of La Fontaine, at the head of the government. For a time it became an understanding that a government, to hold its ground, must have a double majority; that is, a majority both in the British and the French province. The act of reunion had given to the provinces general representation in Parliament, though the population of the French province was much larger than that of the British. Presently the balance of population turned in favor of the British province. The Liberal leaders of the British province, the most pronounced of them at least, then demanded a rectification in its favor. With the political strife about representation by population, "Rep. by Pop.," as it was called, mingled the religious antagonism of the British Protestants of the upper province to the Roman Catholics of the lower. The great advocate of representation by population, and at the same time the extreme exponent of the feelings of the Protestants against the Catholics, was George Brown (q.v.), a Scotch Presbyterian, and founder of the Toronto *Globe*, the most powerful organ of the British Canadian press in those days. On the other side appeared Mr., afterward Sir, John Macdonald (q.v.), one remarkably gifted with the arts of party management, and with an address in dealing with men which in his chief antagonist, George Brown, was wanting. Macdonald supplanted in the leadership of his party the old-time Tory, Sir Allan MacNab (q.v.), Liberalized it, and set it free from all incumbrances in the way of reactionary principle by which, up to this time, it had been weighted in the struggle for place. It was a stroke of strategy something like that performed in England by Sir Robert Peel (q.v.) when, accepting the consequences of the Reform Bill, he changed his party from Tory to Conservative. Between Macdonald and Brown there was, and to the end continued there to be, enmity, personal as well as political. But Brown was no match for Macdonald in playing the party game. Once for a moment, by a casual defeat of the government of which his rival was a member, he set his foot on the steps of power (1858); but he immediately fell again, Sir Edmund Head, then governor-general (1855–61), having, by an unwonted exercise of the prerogative, which Brown furiously resented, refused him the dissolution and appeal to the country which he demanded (1858). Questions and principles of all kinds were crossed by personal ambitions and connections, as well as by the national sensibilities of Quebec, which naturally carried her to the side of the Conservatives rather than to that of the advocates of representation by population, the hot Protestants and the Orangemen.

The end, after a rapid succession of changes of ministry, producing a total instability of government, was a ministry with a majority so narrow that it was said that the life of the government depended on the success of a page in finding a member at the moment of critical division. The upshot was a deadlock. The relation between the two races, owing to the persistent attacks of George Brown's party on the French Catholics, had at the same time become critical and dangerous. From this position an escape was sought by merging the antagonism of British and French Canada in a confederation of all the British colonies in North America. The credit of proposing confederation has been assigned to different politicians, to George Brown, to Sir John Macdonald, to Sir Alexander Galt. Of the party leaders, it was George Brown who first came forward holding out his hand to his rival, Sir John Macdonald, to propose coalition for the relief of the situation. But Mr. Brown's original proposal was not a confederation of all the provinces, but a substitution of a federal for the legislative union between the British and the French province. What Sir John Macdonald, as a strong Conservative and monarchist, preferred was not a federal but a legislative union of all the North American colonies under the British Crown. What all alike wanted was a relief from the situation, and for this purpose a coalition government comprehending the two rivals and enemies, Sir John Macdonald and George Brown, with followers of both, was formed (1864). The fact is that the real author of confederation, so far as British and French Canada was concerned, was deadlock.

The three maritime provinces, Nova Scotia, New Brunswick and Prince Edward Island, were inclined to a separate union among themselves, especially with a view to a reduction of the expenses of government. A conference of delegates from those three maritime provinces was held at Charlottetown (1864). To that conference delegates were sent by the coalition government of Canada to propose a wider union. The result was a conference at Quebec (1865), at which 12 delegates were present from Canada, 7 from New Brunswick, 5 from Nova Scotia, 7 from Prince Edward Island, 2 from Newfoundland. That conference sat for 18 days and passed 72 resolutions on which the act of union was afterward based and which each delegation undertook to submit to its own government.

By the Parliament of the two Canadas the scheme was at once accepted and by a large majority, though there was a long debate in which a speaker of the opposition glanced at the geographical unfitness of the long and broken line of provinces for political union. New Brunswick, not being adroitly approached, at first rejected the scheme, but presently acquiesced. In Nova Scotia the resistance was very strong, but it still remains a mystery by what arguments a legislature elected expressly to oppose confederation was brought round to its support. Brought round, however, the legislature of Nova Scotia was. Howe, after a vain appeal to the British Parliament to set Nova Scotia free, himself took office in the confederation government. Prince Edward Island held out, but came in at last. British Columbia threatened repudiation of the union, till the construction of the Canadian Pacific Railway, which was the condition of her entrance, was assured. Newfoundland still remains unfederated. But a great addition was soon afterward made to the Dominion by the purchase of the Hudson's Bay country now comprising the province of Manitoba and the Northwest Territories. The accession of Newfoundland alone is wanted to complete the scheme of confederation. The scheme having been framed by the colonial legislature, was laid for revision before the British government, and by it embodied in the British North American Act (30 and 31 Vict. Cap. 3; 1867).

When confederation was passed, party lines were drawn again. Brown seceded from the confederation government and the political enmity between him and Sir John Macdonald became as bitter as before.

The Federal constitution was never submitted, like the Constitution of the United States, to the people. It was alleged that in a general election which followed, and in which the confederation government was sustained, the people virtually expressed their approbation. But it is obvious to remark that in this election other issues were submitted and other influences, that of party especially, played their part. So that it cannot be truly said that the constiution of Canada has even been distinctly ratified by the Canadian people.

See articles on this series: UNDER BRITISH RULE TO CONFEDERATION; THE MARITIME PROVINCES; CONFEDERATION; SINCE CONFEDERATION; IMPERIAL FEDERATION; CONSTITUTION. See also the history of the different provinces in this work.

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9. SINCE CONFEDERATION. On 1 July 1867 there were great rejoicings in Canada for it was the birthday of the new Dominion. But at that time the work of founding a Canadian nation was only begun; much remained to do. As it stood on 1 July 1867 the Dominion included only four provinces: Nova Scotia, New Brunswick, Quebec and Ontario, (qq.v.) and of these Nova Scotia was profoundly discontented and, since her people had never voted upon the question, desired to withdraw from the confederation. Nor did Canada possess the entire East. The two important islands, Newfoundland (q.v.) and Prince Edward Island (q.v.) still held aloof; not until 1873 was Prince Edward Island persuaded to join the Dominion, while Newfoundland still stands apart. The vast Northwest, to-day the chief pride and promise of Canada, was not then included within her territory, nor was its entry brought about without discontent and bloodshed. It had long been a hunting preserve for the Hudson Bay Company, but in 1870 by paying to the company £300,000 to extinguish its rights Canada removed every obstacle to her absorption of those regions. In 1871 British Columbia (q.v.) consented to enter the Union, but was long restless and threatened to withdraw unless a transcontinental railway was promptly built. With all these jarring elements assuredly Canada, when confederated, had no real union, and the subsequent work of her statesmen has been chiefly to consolidate her scattered fragments.

The leader who played the chief part in this work of consolidation was Sir John Macdonald (q.v.). In many ways, in wit, in intellectual agility, sometimes in cynical carelessness as to the means he used to secure his ends, he was strikingly like Lord Beaconsfield; but whenever the vital political interests of Canada were concerned, invariably, according to his light, he showed a whole-hearted patriotism. He was filled with passionate devotion to the British Crown and treasured for Canada the ideal that she should be a kingdom modeled on that of Great Britain, taking her place on equal terms as an auxiliary of the United Kingdom. He did not favor federal government, and would have preferred to give Canada one all-powerful legislature like that of Great Britain. But in these respects conditions were too strong for Macdonald. His cherished «Kingdom of Canada» became the «Dominion of Canada» in deference to the supposed prejudices of the American republic against a monarchical neighbor, and he was obliged to assent to a federal system because the French in Canada insisted upon a measure of autonomy only to be secured in this way. It was the pending «Alabama» question that made Britain so anxious at this time to defer to the opinion of the United States. This and questions more directly affecting Canada were settled by the Treaty of Washington, 1871.

Macdonald was Prime Minister of Canada for the long period, 1867 to 1891, with the exception of an interval of about five years, lasting from November 1873 to October 1878. Inevitably he did the work of proving the federal system which he had helped to create. There was trouble from the first. When as a result of the bargain with the Hudson Bay Company Canada assumed jurisdiction in what is now Manitoba, some of the settlers already established there objected to being handed over like cattle to a new government. Surveyors sent in by Canada were turned back; officers going into the country to assert Canadian authority met with a like experience; and at last the half-breed inhabitants under their leader, Louis Riel (q.v.), set up a provisional government at Fort Garry, now Winnipeg (q.v.), and defied the Government of Canada. They tried and summarily executed Thomas Scott, a citizen who opposed their proceedings and they threw other leaders into prison. See RIEL REBELLION.

In 1870 it was not easy for Canada to assert her authority in the remote settlements on the Red River. She might not use for military purposes the territory of the United States, which offered the most convenient route, and she was therefore obliged to send troops through the vast wilderness lying north of Lake Superior. The late Lord Wolseley, then holding a military command in Canada, was chosen to lead a small army to Fort Garry and did the work with brilliant success. After a toilsome journey through hundreds of miles of wild and barren country Wolseley at length reached Fort Garry only to find that Riel and his provisional government had fled at the approach of the Canadian force. Rebellion crushed, the work of pacification was conducted partly with the aid of Mr. Donald A. Smith, later Lord Strathcona, an official of the Hudson Bay Company. Manitoba soon became a full-fledged province in the Canadian federation and has since played an important part. In view of the present status of Winnipeg, the third city in Canada, with perhaps 150,000 inhabitants, it is interesting to remember that it had not even the telegraph in 1870 and that the railway did not reach the town until 1878.

The trouble in Manitoba settled, Canada had next to pacify her remote Pacific Province, separated from her by an immense and almost unpeopled wilderness. In 1871 British Columbia entered the confederation on the condition that a railway across the continent should be begun within two years and completed within 10. At the time the province contained but a few thousand people of European origin, and there were complaints in eastern Canada that the vast expenditure involved in the bargain would burden too heavily the country's resources. But, on pain of her withdrawal from the union, Britsh Columbia insisted angrily that the bargain should be carried out, and her attitude brought to the front the building of the trans-continental line which was to prove of supreme moment to Canada.

That Canada's small population should spend a hundred million dollars on this undertaking was a stupendous proposal; on the basis of the proportionate cost of each head of population a project for the United States to spend $2,000,000,000 would be its equivalent. But to build the railway was the condition of national existence in Canada, and in the end the thing was done. Not, however, before the project had long disturbed Canadian political life and threatened to overwhelm its promoters with ruin. When the Canadian Pacific Railway (q.v.) was projected, Canada was face to face with the question that has perplexed all the progressive states of modern times. Should the railway be a government or a private enterprise? Though a similar line, the Inter-Colonial Railway, connecting the eastern provinces, was a state enterprise, the cabinet of Sir John Macdonald shrank from saddling the country with so vast a burden as a railway to the Pacific, and it was resolved to hand over the task to a private corporation.

In 1872 there was a general election in Canada, and in the session of Parliament which followed the Canadian Pacific Railway Company with Sir Hugh Allan as president, secured a charter to build the road. With this went also assurances of assistance from Canada amounting to many millions. But when, as a result of the exposure by the opposition, the fact came out that Sir Hugh Allan had contributed more than $350,000 to Sir John Macdonald's campaign fund for the recent election, this "Pacific Scandal" brought the downfall of the Government, which had accepted the obvious bribe. Amidst great excitement Sir John Macdonald resigned and the Liberals with Mr. Alexander Mackenzie (q.v.) as prime minister took office in November 1873.

For five years the Liberals remained in power. Throwing less energy into the construction of the Pacific Railway than had been promised, they met naturally with discontent in British Columbia. The menace of withdrawal from the confederation was renewed and at length the matter was referred for arbitration to Lord Carnarvon, the Colonial Secretary, in London. He decided that the original terms were too onerous and proposed new ones under which a trans-continental railway should be opened by the end of the year 1890. When the Liberal Government thought even this almost impossible of accomplishment, "Carnarvon Terms of Separation" became the war cry in British Columbia. Financial depression overtook Canada in 1876–78 and this heightened the difficulty of the question. But in 1876 the Governor-General of Canada, the Earl of Dufferin, visited British Columbia to soothe her discontent, and he helped to tide over the period of danger. It is interesting to speculate whether an attempt to withdraw from the Canadian union would have been resisted, if necessary, by force of arms. Probably the Canadian and Imperial governments would have agreed in using coercion.

The financial depression that helped to delay contentment for British Columbia produced effects in Canada even more far-reaching, for it led to the cleavage of political parties on the question of Protection (q.v.) or Free Trade (q.v.). In 1878 Canada had a tariff of 17½ per cent, which was hardly sufficient for her growing revenue requirements. During a generation she had tried to secure free exchange of natural products with the United States and in 1854 her governor, Lord Elgin, had succeeded in making a Reciprocity Treaty on this basis. But the treaty was not long in force and when abrogated at the close of the Civil War a heavy tariff upon Canadian products was soon imposed by the United States. Over and over again Canada tried to secure the reversal of this policy but always in vain. Meanwhile the low Canadian tariff permitted American manufacturers to supply the Canadian market at prices with which the necessarily smaller producers in Canada could hardly compete, and in time the cry for increased Protection was often heard. Had Mr. MacKenzie's Government taken it up in 1878 probably Sir John Macdonald would have rallied his forces under the banner of Free Trade. But when the Liberal leader refused tenaciously to adopt Protection, Sir John Macdonald proclaimed it as a "National Policy" for building up Canada, and the Canadian electorate, forgetting the discredit which attached to him in connection with the Pacific scandal, returned him to power by an overwhelming majority. Since that time Protection has retained its hold upon Canada, for though the Liberals favored free trade they disturbed the system but slightly on their advent to power in 1896.

An era of great expansion followed the adoption of a protective tariff in 1879. A great many factories were established, and the building of the Canadian Pacific Railway was pushed on with unparalleled energy; in 1885, five years before the time named in the contract, the last spike was driven in the line connecting Western and Eastern Canada and British Columbia's grounds for discontent were finally removed. Once completed the road's value not only to Canada but to Great Britain was soon apparent. Not only did it unite the Canadian provinces; it furnished a ready all-British land route to the East. The Canadian Pacific Railway Company in time established lines of steamers crossing both the Pacific and the Atlantic, and the highway, looked upon as a doubtful possibility in 1878, has now become one of the chief arteries of world commerce.

The completion of the Canadian Pacific Railway was almost coincident with a second rebellion of half-breeds in the Canadian West. On the banks of the Saskatchewan, not far from a village called Prince Albert, there was a colony of these people. They had long lived remote from the larger world, and when their country was invaded by the pioneers of modern movement, they began to doubt whether they should be left in permanent possession of the lands they had long occupied. Upon these lands they were technically "squatters" for they had no patents and no surveys had been made. When at length Canadian surveyors came to lay out their fields on a uniform plan, disregarding the divisions which they had established, the half breeds protested and demanded that they should be granted patents for their lands as they stood. At Ottawa their protests were filed but remained unheeded. The official mind was aghast at the prospect of land grants not based upon the usual survey; the half breeds could get nothing done and they grew ever more restless at the supposed menace to their rights. Disinterested observers sent to Ottawa warnings of a probable rising but official supineness was invincible, and the result of neglect and delay was that in March 1885 the despairing half breeds attacked a body of police, killed 12 out of 40 engaged, and defied the authority of Canada. Since it was not unlikely that they would be joined by the Indian tribes the outbreak was serious.

The half breed leader was the same Louis Riel (q.v.) who had caused trouble in 1870. On its hands the Government now had a difficult task. As in 1870 it might not send troops through the United States, and the railway on the north shore of Lake Superior connecting Eastern and Western Canada was not yet completed. In bitter March weather, with the thermometer often below zero, the regiments of militia summoned from Eastern Canada, all unprepared by previous hardship to endure the cold, traversed the desolate shores of that frozen region. Sometimes in open flat cars, for more than a hundred miles on foot, they proceeded over the snow. An experienced officer of the expedition declares that the task was more severe than Napoleon's passage of the Alps, for Napoleon had a beaten road and an abundant commissariat, while both were wanting in the Canadian wilderness. The regiments soon poured into the West in overwhelming force and though the few half breeds made a brave stand against great odds, they were quickly crushed. Their Indian allies the Canadian troops wearily followed to their almost trackless haunts, and so the rebellion was put down. A few of the rebels were hanged; a good many of the Indians were imprisoned; Riel, the leader was taken, and then his fate became a question of national concern in Canada.

With Riel the French Canadians had ties of faith and of blood. French Canadians had been pioneers in the Northwest and at times they had dreamed of holding that vast region for their language and faith. If fate was against them, if it was the Anglo-Saxon who was occupying the country and in influence was destined to dominate, none the less was chivalrous support due to the few people who stood in the West for the ideals of France and of the Roman Catholic Church. In 1870 Riel had appealed not in vain to the French in Quebec for help in his time of trouble and it was probably the strength of their sympathy which then saved him from the scaffold. Since in 1885 the men who took up arms had more real grievances the Church espoused their cause. In the Province of Quebec Liberals and Conservatives forgot their quarrels in the name of justice and French Canadian nationality against rigorous treatment of the rebel leader, Louis Riel. On the other hand the English demanded that the law should take its course. Riel had led a revolt in which law-abiding citizens were shot down. If he was a murderer the penalty of murder was his due. The demand was too urgent to be disregarded. Riel was tried; in the eye of the law the penalty of his crime was death, and in November 1885 he was hanged at Regina, the capital of the Northwest territories. See RIEL REBELLION; see also article JESUITS ESTATES ACT for another religious and racial question in Canada in 1888–89.

The government's course in regard to Riel was a defeat for the French Canadian bishops who had long played an active part in political life. They claimed that even in secular affairs the authority of the bishops was final and that when they spoke the laity were bound to obey. If the Church chose to indicate her desires in regard to the merits of candidates seeking election, it was the duty of the voter to heed the voice of his spiritual directors. Some of the bishops claimed the right to use spiritual censures to influence electors. Newspapers which opposed the wishes of the hierarchy must not be read by the faithful, and when *L'Electeur,* a daily newspaper in Quebec, opposed the bishops' *Mandements* in 1896 it was denounced from the altar, and under penalty of grievous sin and the refusal of the sacraments all the bishops forbade formally anyone to read it, to subscribe or contribute to it, to sell it or in any manner whatever to encourage it. The denunciation commanded obedience and made the continued existence of the paper under its existing name impossible. It promptly became *Le Soleil,* and seemed to suffer little real injury, but the incident showed the authority claimed and exercised by the bishops.

With this attitude on their part occasions of strife were not likely to be wanting. In 1890 the Manitoba government passed an act establishing a non-sectarian system of education. Owing to the peculiar conditions of older Canada the Protestant minority in the province of Quebec had secured the constitutional right to devote the taxes paid by them for education in support of their own schools. In Ontario the Roman Catholic minority possessed a similar privilege. For some time Manitoba had followed the example of Ontario, but, impressed by the obvious advantages of a uniform system, the legislature passed the Act of 1890 which deprived Roman Catholics of former privileges. At once a vehement agitation broke out. The Federal government possesses, within certain limits, the right of disallowing statutes enacted in the provinces and urgent demand was made upon the government of Sir John Macdonald to disallow the Manitoba School Bill. This, on the ground that Manitoba was acting within its constitutional rights, the government refused to do. Appeal was then made to the courts to determine the authority of the respective governments in the matter and the case was finally carried to the Privy Council in London, which decided that the Federal government possessed the right of intervention in regard to the Manitoba schools.

Extraordinary pressure was then brought to bear upon the Federal government. The hierarchy of the province of Quebec took up the question with much heat, while the Protestant province of Ontario was also aroused in support of the opposite side. In 1891, when Sir John Macdonald died, his successors were left with the legacy of the Manitoba school question. The agitation dragged on for five or six years. Retreat from their position the Manitoba government would not, and finally, in 1896, the Federal government endeavored to put through Parliament a remedial bill for restoring to the Roman Catholics of Manitoba the privileges which had been taken away.

It was this question that brought the downfall of the Conservative party so long dominant in Canada, a process accelerated by evidence adduced in 1891 of a share by responsible leaders in the province of Quebec in the misuse of public funds. In 1896 Sir Charles Tupper (q.v.) became Prime Minister and in a general election appealed to the country to do justice to the minority in Manitoba. On this question many of his Conservative allies broke away from him and he fought a stern but losing contest. The Liberals too were in a difficult position. When Sir John Macdonald's old rival, Mr. Alexander MacKenzie, retired from the leadership of the party in 1880 he was succeeded by Mr. Edward Blake, who, in turn, proved unable to overthrow the Conservative chieftain. In 1887 Mr. Blake retired and was succeeded by Mr., afterward Sir Wilfrid, Laurier. In personal charm and tact the new leader was not unlike his formidable rival, and he had, besides, remarkable gifts as an orator. French Canadian by birth and also a Roman Catholic, it was not easy for him to lead the Liberal party, which was committed unreservedly against interfering in Manitoba. In Mr. Laurier's own province of Quebec the hierarchy were still unanimous in demanding intervention to re-establish the Roman Catholic schools. The election of 1896, fought chiefly on this issue, resulted in a conspicuous Liberal triumph and it was in Quebec that Mr. Laurier found his most striking support. Either the issue in regard to Manitoba had been obscured or the "*habitant*" wished to assert his right to pass judgment for himself in political matters independent of the views of the hierarchy. At any rate Mr. Laurier became Prime Minister of Canada. The Manitoba government made some minor concessions and the matter passed out of view, but an important warning against interfering with the authority of the province had been given to the Federal government.

The Liberal party had long championed the cause of freer trade and declared itself the enemy of Protection; it was therefore committed to some modification of the existing protective system. But, once in power, it found that, since important industries had grown up under the tariff, this could not be changed in any radical manner without ruin to those concerned. While doing something to reduce Protection the government took a further remarkable step. The year 1897 saw the completion of 60 years under Queen Victoria's sovereignty, and there was a general desire to draw more closely together the different sections of the empire, and thus to assert British unity. In pursuit of this idea Mr. Laurier's government announced that a preference of 25 per cent (later increased to 33⅓ per cent) would henceforth be allowed to countries whose tariff gave a favorable opening to Canadian products. Since Britain alone gave such treatment the preference was confined to her, though other countries might share in it on the terms laid down. Both in England and in Canada the preferential tariff aroused great enthusiasm and no doubt it aided in bringing to a head Mr. Chamberlain's scheme, announced a few years later, for a preferential tariff in the mother country for colonial products.

In 1898 the Liberal government had a renewed opportunity to proclaim its devotion to British connection. When war broke out in South Africa and soon proved more serious than had been thought possible, Canada promptly volunteered to send military contingents in reinforcement of the British troops. The contingents saw some service and a good many Canadian soldiers lost their lives. Naturally the French Canadian showed less enthusiasm for what was in large degree a racial war than did the British element. Only a few French Canadians served in the contingents, and some voices protested against Canada's participating in British wars. But the overwhelming opinion of the country supported the rally to Britain's aid; when the government appealed to the country in 1900 it gained an easy victory, partly upon this issue.

A little earlier the discovery of gold in remarkable quantities in the Yukon territory, arousing as it did world-wide interest, naturally attracted attention to a part of Canada hitherto thought of little value. The possession by the United States of the adjacent coast of Alaska (q.v.) through which lay the best route to the new gold country seriously impaired the value to Canada of the territory. The boundary between Alaska and Canada had long been the subject of dispute, the Canadians contending that since, under the terms of the determining treaty, the line should run from headland to headland, the land at the head of the inlets which furnished the most ready access to the Yukon were in reality British territory. Canada's cause was prejudiced by the fact that (though not without occasional protest) she had acquiesced in the American contention that the boundary line followed the sinuosities of the shore. A disputed boundary is always dangerous. Besides this question there were other matters requiring settlement between the United States and Canada, and at last, in 1898, a Joint High Commission, including prominent representatives of both the American and British side, was appointed and sat for some weeks at Quebec and then at Washington. In addition to the Alaska boundary the commission was, if possible, to agree upon a settlement of the differences in regard to the seal fishery in Behring Sea and the Atlantic fisheries; and besides minor matters was to consider the general trade relations between the two countries. Points of variance proving too great, the commission effected nothing; but in the end the two governments agreed that six jurists of repute, three to represent each side, should be appointed with authority finally to settle the Alaska boundary. In the end a majority of the commissioners gave, in 1903, a decision favorable to the claims of the United States. Lord Alverstone, the British commissioner who supported the American contentions, was severely censured in Canada for an attitude that seemed more diplomatic than judicial, but in spite of a passing irritation there was general satisfaction that a troublesome issue had at last been settled. See ALASKAN BOUNDARY COMMISSION.

It has been said that the politics of Canada are railways. In a country so vast, means of transportation are of vital moment. Thus it happened that, after the Canadian Pacific Railway was completed, plans were soon on foot for other transcontinental lines. Since the Canadian Pacific Railway ran near the southern frontier, new lines, it was thought, should open up regions farther north. In 1903 Sir Wilfred Laurier announced that the government of Canada had plans for a new transcontinental railway. The government was to complete the railway from Moncton, New Bruswick, to Winnipeg, while from that point to the Pacific Coast, at what is now Prince Rupert, the Grand Trunk Pacific Railway Company was to build the line and it was to operate this section and also that from Winnipeg to the Atlantic to be leased to the company by the Canadian government. A little earlier a private firm, Messrs. Mackenzie and Mann, had matured plans for a similar line to cross the Rocky Mountains farther south. The firm had only the capital of remarkable energy. It was by means of government bonuses and guarantees of its bonds that the necessary money was to be obtained. In the end it secured guarantees of this kind amounting to about $250,000,000. Efforts to unite the two plans and to build a single new line were, unhappily, not successful. At the present time (1918) both lines have been nearly completed. Their cost has been very great and it came at a time when taxation grew heavier as the great war approached. Three transcontinental lines in a country with a population of less than 8,000,000 were a heavy burden. In 1917 the Canadian government took over the Canadian Northern which could not meet the interest on its bonds and there is, at the moment of writing some prospect that, to promote economy and efficiency, the government will, for the duration of the war and, it may be, as a permanence, control also the Canadian Pacific and the Grand Trunk Pacific with its parent company, the Grand Trunk. The government of Canada will then direct three vast railway systems, each of them stretching from the Atlantic to the Pacific.

The growth of the Canadian West was obvious in 1905 when, from a part of the former Northwest territories, were created two new self-governing provinces, Saskatchewan and Alberta, which together fill the gap between Manitoba on the east and British Columbia on the west. In the background of Canadian politics lurks always religious and racial strife, since two-fifths of the population are Roman Catholics and form a minority so powerful as to keep alive the suspicions of the Protestant majority. In creating the two new provinces, Sir Wilfrid Laurier proposed to allow the majority in a school district to determine the religion, if any, to be taught in the school, the minority to have separate schools with the same privilege and each school to be kept up by taxes on its supporters. Any government grant was to be equitably divided. Since 1875 the Roman Catholics had had the right to separate schools in the territory affected. The policy of the Prime Minister secured the strong support of the Catholic clergy of Quebec but it was as firmly opposed by a larger number of Protestants. A crisis in the government followed and, in the end, the bill was so modified as to place the proposed schools under effective state control. All through the West the demand for sectarian and racial privileges regarding education was pressed. Ruthenians, Poles, Germans and others, besides French in Manitoba, demanded the right to have schools conducted in their own language and declared that this was a sacred heritage, not to be denied to their children without gross injustice. For a time in Manitoba some half dozen languages were used in the schools with official sanction. The need was urged of requiring English in all the schools, if a common Canadian nationality was to be fostered. In 1915 the former Conservative government of Manitoba was defeated and in 1916 the new Liberal government passed a measure requiring the use of English as the teaching language in all the schools and, for the first time, making elementary education compulsory.

The strife in Manitoba angered the French element in Canada. They urged anew the rights guaranteed to their language. Without doubt the original constitution of Manitoba, created in 1870, had set up a bi-lingual system, with French and English on an equality. The truth is that, in a majority at first, the French in the province had by 1916 become relatively unimportant. It was undoubtedly a grievance that rights formerly enjoyed by them should be swept away. The strife spread eastward. Under what is known as Regulation 17, the province of Ontario took steps to ensure that, except in a strictly limited number of admittedly bi-lingual schools (French and English), English alone should be used. In Quebec where the majority is French no one challenged the right of the English element to schools using their own language. Though, in fact, in Ontario no constitutional provision supported bilingualism, the French urged that, on any basis of justice, the French minority should have the rights in respect to their language which the English minority enjoyed in Quebec. The English element in Ontario, it was declared passionately, was persecuting those who used French. Their French press carried on a violent agitation, answered in kind by the Orangemen of Ontario, who feared that with the French tongue would go the dominance of the French-speaking priest. The claim that constitutional guarantees protected the right to use French in the Roman Catholic separate schools of Ontario was negatived on appeal to the Imperial Privy Council, the tribunal to determine finally such constitutional disputes. Trifling as such questions seem, they yet served to make the French, dominant in the province of Quebec, resentful and suspicious, and this no doubt affected their attitude when the European War broke out in 1914.

In 1911 the government of the United States entered into negotiations with the government of Canada for a wide measure of reciprocity in trade. At first the proposal was welcomed by members of both political parties in Canada, but it soon became clear that financial interests in Canada feared the dominance of New York, that Canadian industries were alarmed lest a protective tariff should disappear, and that the Canadian railways, running for thousands of miles east and west, feared a loss through the diverting of the carrying trade southward to the lines of the United States. In the background was the fear of those attached to the political tie of Canada with Great Britain that Canadian trade would discriminate against Great Britain in favor of the United States with the result either of bringing Canada into the American Union, or, at any rate, of severing the tie with Great Britain and the setting up of a republic of Canada. The political campaign revealed the profound attachment of the Canadian people to Great Britain. An election in September 1911 resulted in the defeat of Sir Wilfrid Laurier, who had made the reciprocity pact with Mr. Taft. A Conservative government under Mr. (now Sir) Robert L. Borden came into power and the proposals for reciprocity were dropped.

In 1914 came the Great War and the whole life of Canada was soon to be focussed on this event, discussed elsewhere (see CANADA AND THE WAR). In 1917 Canada celebrated the 50th anniversary of the Federal union created in 1867. It had been a period of varied fortune, of reverses as well as of successes. The population had doubled and the 8,000,000 people of Canada in 1917 represented about the same number that the United States had had a hundred years earlier. Not until toward the end of the first decade of the 20th century had the development of Canada been very rapid. By 1911 a remarkable immigration movement was at its height. More than half a million settlers from the United States had by that time found new homes in Canada. Settlers from Great Britain and from continental Europe were also flocking in and the prairie country, hitherto almost tenantless, was filling up rapidly with varied types of human beings. Probably, considering the small population of Canada, they came too rapidly, for half a million newcomers in a single year could not be readily assimilated when the new arrivals represented about 1 in 10 of the existing population. For the transport involved railways were built in the West too rapidly to be profitable. Even before 1914, depression in all parts of the Western world had tended to check the tide of immigration, and, for the time, the war, begun in that year, suspended it completely. Probably, on the whole, this suspension was in the best interests of Canada, since it ended a speculative fever in regard to lands and brought optimists face to face with stern reality. Already there is much talk in Canada of reconstruction after the war. In a world shattered by war's disasters it will be a problem for the wisest statesmanship to use the undeveloped resources of Canada to create homes for the landless and penniless who will turn from devastated Europe to the founding of a new life in the West. (See CANADA — POPULATION, IMMIGRATION AND DISTRIBUTION). In Canada, as in every belligerent country, the great war is producing far-reaching effects. Since the war began one by one the Canadian provinces from the Atlantic to the Pacific have imposed such restrictions and prohibitions on the traffic in intoxicating liquors as practically to annihilate it. At the time of writing, from Ontario westward every drinking place is closed. By May 1919 Quebec, including the great city of Montreal, will have done the same thing, and in the Maritime provinces, farther east, by local option, a similar result is nearly achieved. It is likely that by 1920 liquor will not be sold by retail anywhere in Canada except for medical purposes.

When the war broke out, in 1914, Canada had a party government, the result of the victory of reciprocity in 1911. In 1916 the term of five years for which a Parliament is elected expired, but, by agreement between the two great parties, the period was extended by a year. As the war went on, the need was felt of united support of the government so as to avoid the dissipation of energy by party strife. In the summer of 1917, Sir Robert Borden made proposals to Sir Wilfrid Laurier to unite in forming a Cabinet in which the two parties should be represented equally, but this offer the Liberal leader declined. He would not accept the policy, insisted upon by Sir Robert Borden, of compulsory military service in order to keep up the Canadian divisions in France. The French Canadians, who are more than a quarter of the people of Canada, had shown themselves hostile to conscription, and on this issue Sir Wilfrid Laurier stood with the members of his own race.

English-speaking Liberals refused, on this point, to follow the lead of Sir Wilfrid Laurier, and the autumn of 1917 saw the formation in Canada of a Unionist government, led still by the former Conservative Prime Minister, Sir Robert Borden, but composed in about equal proportions of Conservatives and Liberals. Since, without practically unanimous consent, the term of Parliament could no longer be extended, an election followed in December 1917, with conscription as the vital issue. Sir Wilfrid Laurier led the forces opposed to conscription. In his own province of Quebec he achieved a personal triumph, carrying 62 out of 65 seats. From the other provinces, however, he secured little more than a score of supporters, and the Unionist government was sustained by an overwhelming majority. The policy of compulsory military service was pressed with energy and Canada has proclaimed to the world her resolve to make every sacrifice to stay in the war to the end.

The disappearance of party government is already producing far-reaching effects on the political life of Canada. The evils of the spoils system had long corrupted politics and this system the Union government has swept completely away. Appointments to the whole civil service are now controlled by a non-partisan Civil Service Commission. Purchases for the government service are made by a committee of experts without regard to party claims. In abolishing the old system, Canada has lagged far behind both Great Britain and the United States, but her reform now promises to be thorough. In respect to other changes Canada is likely to be conservative. Socialism has, as yet, produced little effect on a country where nearly every farmer owns the land he tills and the artisan and the laborer earn high wages. It is still problematical what effect the war will have on the relations of Canada with Great Britain. It has already demonstrated three things: Canada's resolve to settle for herself the part, if any, she shall take in British wars; the solidarity of Canadian opinion with that of the other British peoples on the issues of the present war; and the affection and mutual confidence which exists between the peoples scattered in all parts of the world who have a common British allegiance. Whether out of the welter of the war will come a closer political union of the peoples of the British empire for their common defense it is impossible now to say. The question will receive increased attention after the war. It is certain that a unity of aims already exists which will hold together these people whatever political form their union may assume.

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10. THE CANADIAN WEST. It is doubtful if a British sovereign ever made a more munificent grant to a company of his subjects than did Charles II, in the year 1670, to "The Governor and Company of Adventurers of England trading into Hudson Bay." The sweeping terms of the royal charter defined an area stretching from Hudson Bay to the Rocky Mountains, to which was given the name of Rupert's Land, in honor of the King's cousin, Prince Rupert, the company's first governor. In spite of the hostility of the French Canadian government and the competition of rival traders, the Hudson's Bay Company succeeded in holding this territory down to the date of its cession to Canada two centuries later. Although a century had elapsed since Sir Francis Drake had sighted the snowy peaks of the Pacific Coast, and half a century since the ill-fated Henry Hudson had discovered the bay which became at once his grave and the monument of his achievement, yet the history of the Canadian West may be said to date from the founding of the Hudson's Bay Company. See CANADA — THE HUDSON'S BAY COMPANY.

The presence of the English company upon the shores of Hudson Bay was from the outset a serious menace to French Canadian influence in the Northwest. The newcomers were drawing off the trade of the northern tribes. English and French were face to face in a struggle for commercial supremacy in the West, and their rivalry was bound sooner or later to break into a clash of arms. The Hudson's Bay Company had strengthened its position by the establishment of four trading-posts: one upon the west shore near the Nelson, and the other three, Forts Albany, Hayes and Rupert, on the south arm of the bay. In the spring of 1686 the progress of trade was rudely interrupted. Chevalier De Troyes and a company of 80 adventurous Frenchmen, ascending the Ottawa, worked their way slowly by stream and lake over the height of land to the neighborhood of James Bay. So sudden was their coming, and so spirited their attack, that the three lower forts fell almost without resistance.

In 1697 Pierre le Moyne D'Iberville, who had been De Troyes' right-hand man, entered Hudson Strait, under orders from Quebec, to attack Fort Nelson, the most important trading-post on the bay. The *Pelican,* which carried the commander, became separated from the rest of the fleet and fell in with three English ships belonging to the Hudson's Bay Company. In the encounter which followed the *Pelican* sank one of the company's ships and disabled a second, while the third made off under full sail. Rejoined by his missing ships, D'Iberville soon forced Fort Nelson to surrender. In 1713 the Treaty of Utrecht put an end to hostilities and left the English traders in undisturbed possession of their posts.

Meanwhile French Canadian traders were extending their trade beyond Lake Superior. With these there was ever present the desire to find *La Mer de l'Ouest,* which they thought could not be far distant. The ambition to discover this «Western Sea» possessed the mind of Pierre Gaultier de Varennes de la Vérendrye, the commander of a little post on Lake Nepigon. It was late in August 1731 that Vérendrye and his party passed over Le Grand Portage leading over the height of land to the waters flowing toward Lake Winnipeg. The mouth of the Maurepas (Winnipeg) River had been reached when troubles began to crowd upon the unfortunate explorer. The merchants who were to forward supplies failed to do so; his nephew died; and, as a climax to his misfortunes, 21 of his company, including his eldest son, were butchered by a band of murderous Sioux. It was not until six years later that Vérendrye again turned his face westward. The course of his travels was marked by a series of trading-posts built at successive stages. Among these were Fort La Reine, near the site of the present town of Portage la Prairie, and Fort Rouge, whose name still clings to a suburb of the city of Winnipeg.

During the last century of the French régime the Hudson's Bay Company had held its own throughout the dangers of war and the competition of trade. Its forts had fallen into the hands of De Troyes or D'Iberville, but had been restored by the Treaty of Utrecht (q.v.). Though the dangers of war were past, the rivalry of the Canadian traders had still to be met. Despite the long overland journey, the latter penetrated to the neighborhood of Hudson Bay, attracting the Indians with showy trinkets, and too often with brandy. The majority of the natives, however, were not easily drawn away from the old company's forts. Every spring the rivers and lakes were dotted with fur-laden canoes making their way to Lake Winnipeg, the meeting place of the hundreds of natives who journeyed annually to Hudson Bay. As many as 500 canoes in a year made the long and toilsome journey to York Factory. Here they exchanged their dearly-earned furs for coats, blankets, kettles and tobacco, or for necessities of the hunt, such as guns, powder, powder-horns, shot, hatchets and knives.

The conquest of Canada by Great Britain brought about an immediate and complete change in the fur trade. With the passing of the French régime, monopoly and licenses disappeared. The officers of the French company withdrew from the country rather than live under the British flag. The *coureurs de bois,* suddenly cast adrift, lacked the capital necessary to continue the fur trade. New employers, however, were soon at hand. The old route from the East, up the Ottawa and across Lake Superior to Grand Portage, had scarcely forgotten the passing of the French traders when it was traversed afresh by British merchants from Montreal. Alexander Henry, Thomas Curry, James Finlay and the Frobisher brothers were the hardy forerunners of a new race of traders, whose enterprise and daring soon carried them into the Saskatchewan and Athabasca districts. In order to compete the more successfully with their long-established rivals, the newcomers, who at first traded individually, decided upon union, a decision which led to the founding in 1783 of the Northwest Company. Under the stimulus of competition the operations of both companies quickly extended northward to Lake Athabasca and westward to the foot-hills of the Rockies.

The necessity of enlarging the field of trade gave a remarkable impulse to exploration. In penetrating the unknown lands, north and west, the pioneer traders rendered invaluable service to their country. The honor of leading the way into the northland belongs to Samuel Hearne, a servant of the Hudson's Bay Company. Setting out from Prince of Wales Fort, Hearne succeeded, after two failures, in reaching the Coppermine River. He was the first white man to arrive at the Arctic shores from the interior. The men of the Northwest Company were not slow to follow the example of their rivals. No name holds a prouder place in the annals of American travel than that of Alexander Mackenzie. Fort Chipewyan, situated upon the shores of Lake Athabasca, the trade centre of the north, was the starting point of his two great journeys. The «Western Sea,» the elusive goal of Vérendrye's travels, was the object of Mackenzie's quest. His first journey, made in 1789, terminated at the Arctic Ocean. Choosing a more westerly stream for his second attempt, Mackenzie ascended the Peace River to its source in the Rockies, crossed the height of land, and, after descending the Fraser River a short distance, struck out across country for the sea. The successful issue of the journey was proclaimed by the following words inscribed upon the face of a rock overlooking the waters of the Pacific: «Alexander Mackenzie from Canada by land, the twenty-second of July, one thousand seven hundred and ninety-three.» Two other Nor'westers, Simon Fraser and David Thompson, also made their way to the Pacific Ocean, the former in 1808 by the river which bears his name, the latter in 1811 by the Columbia.

While British explorers were forcing a way across the continent, British seamen were making good their country's claim to the Pacific Coast. In 1778 Captain Cook touched at Nootka, on Vancouver Island. At this centre of trade Capt. John Meares 10 years later established a settlement, which unfortunately was soon destroyed by the Spaniards. In 1792 Capt. George Vancouver, being sent out to inquire into the action of the Spaniards, forced the latter to withdraw from the scene of their outrage. As the result of arbitration Great Britain received the entire coast line.

Down to the close of the 18th century the ruling interest of the West centred in the fur trade. Lord Selkirk it was who first conceived the idea of planting a settlement at the heart of the continent. From the Hudson's Bay Company he secured a grant of 110,000 square miles in the valley of the Red River, a district henceforth called Assiniboia. Settlers were hurried out from Scotland, and in 1812 a small company, 70 in number, made its way inland from York Factory.

The newcomers were looked upon as intruders by the Nor'westers, who suspected that Lord Selkirk, being a shareholder in the Hudson's Bay Company, had planted his colony to interfere with the trade of the Canadian company. The early years brought trying experiences to the settlers. So great was the scarcity of food that the governor, Miles Macdonell, issued a proclamation to the effect that «no provisions, flesh, fish, grain or vegetables were to be taken out of the lands of the settlement for a year.» This action brought the hostility of the Nor'westers to the point of violence. Some of the colonists were bribed to desert, the remainder were driven out by a band of Métis, or half-breeds. Almost immediately, however, the refugees returned, reinforced by another company of immigrants. With the new arrivals came Robert Semple as governor.

Meanwhile Lord Selkirk had arrived in Canada. Hearing at Montreal of the misfortunes of his colonists, he had engaged the services of 100 discharged soldiers and set out for the West. While he was yet on the way, stirring events were happening in the Red River Valley. The Nor'westers, angered by the destruction of their fort on the Red, bestirred themselves to destroy the settlement. A strong band of half-breeds was gathered at Portage la Prairie under the leadership of Cuthbert Grant. On 19 June 1816 Governor Semple was informed that a body of horsemen was approaching over the prairie. Taking a small force, he marched out to inquire the purpose of the intruders. This move precipitated a skirmish at a spot now marked by the Seven Oaks monument. When the firing ceased Semple and 21 of his followers lay dead or mortally wounded. By this disaster the settlers were forced to again leave their homes.

The news of Seven Oaks was a signal for great rejoicing at Fort William, the headquarters of the Northwest Company. The joy of the Nor'westers, however, was rudely dispelled by the sudden arrival of Lord Selkirk. The latter, acting in the capacity of magistrate, arrested several of the leading partners, and sent them down to York, Upper Canada. In the following spring he pushed on to the Red River, where he promptly restored the ejected colonists to their farms, settled his soldiers about Fort Douglas and made a treaty with the Indians.

When the news of the tragic death of Semple and his men reached England, the imperial government at once interfered. Both parties to the quarrel were ordered to give up all posts and property seized. The death of Lord Selkirk in the year 1820, though to be regretted, was beneficial to the West, removing as it did the last obstacle in the way of a union of the fur companies.

After the union, which took place in 1821, the management of the company's affairs rested with an official known as the governor of Rupert's Land, assisted by a council of chief factors and traders. A strong man was needed for the governorship, and such an one was found in the person of a young Scotchman named George Simpson, who ably guided the fortunes of the company during the next 40 years. To the enterprise of the Hudson's Bay Company, in no small measure, Great Britain owes her control of the Pacific Coast. From the north Russia, from the south the United States, were pressing vital claims which threatened to shut out Great Britain entirely from the sea. Under Simpson's aggressive administration the country between the Rockies and the Pacific was occupied. A fleet of six armed vessels protected the company's coast trade, of which Fort Vancouver was the centre.

Meanwhile the Selkirk settlement, clustering about the historic walls of Fort Garry, was winning its way to prosperity. The hardships of pioneer life in the East were here repeated. Spade and hoe, sickle and cradle, flail and quern, all told of the day of small things. A series of disasters, in the form of grasshoppers and floods, failed to shake the courage of the sturdy settlers. The growth of the colony made necessary a change of government. The people complained that the members of the council of Assiniboia were paid servants of the company, and did not, therefore, represent the popular will. Discontent was a sign of progress, a sign that the settlement was growing beyond the control of a fur company.

The steadily growing importance of the Pacific country made it imperative to determine the boundary line between America and British territory in the West. The 49th parallel was the accepted line as far as the Rockies, and it was agreed that for the time being the country beyond the mountains should be «free and open» to both nations. In 1846 the Oregon treaty continued the boundary line along the 49th parallel to the channel separating Vancouver Island from the mainland. The line was to follow this channel southwesterly to the Pacific Ocean. For several years the ownership of the island of San Juan was in dispute. The question was finally referred for settlement to the German Emperor, who gave his award in favor of the United States.

To maintain order among the lawless miners whom the discovery of gold had drawn to the Pacific Coast, a separate government was established on the mainland. New Westminster, on the Fraser River, became the capital. This arrangement, however, proved unsatisfactory; and at times there was talk of annexing Vancouver Island to the United States. Fortunately a strong British sentiment prevailed, which led to the reunion, in 1866, of the island and the mainland, to form the province of British Columbia. Victoria was chosen as capital.

The British North America Act made provision for the admission to confederation at any time of British Columbia, Rupert's Land and the Northwest territories. The first Dominion Parliament petitioned the British government to hand over to Canada Rupert's Land and the Northwest. It was claimed that the rule of a fur company did not tend to the general development of the country, and, moreover, that the extension of the Dominion westward would be a safeguard against any aggression on the part of the United States. The Hudson's Bay Company finally surrendered to Canada its control of Rupert's Land and its monopoly of trade. The company, in return, received the sum of £300,000, one-twentieth of all land thereafter surveyed for settlement, and also retained its posts and trading privileges.

At the time of confederation (q.v.), the only occupants of the land beyond Lake Superior were roving bands of Indians, a few scattered traders and 12,000 settlers in the valley of the Red River. Ten thousand of these 12,000 were half-breeds, Scotch and French. Into this community, without warning, flocked Canadian surveyors to lay out roads and townships. The country had been handed over to Canada and the interests of the natives were to be sacrificed. Such was the thought of the half-breed element. The storm centre was the French half-breed party, the Métis, led by Louis Riel (see RIEL REBELLION). There was no one in the colony to restrain the latter's madness. Fort Garry was seized and a «provisional government» established. There was every prospect, however, of a bloodless settlement of the situation, when suddenly Riel, in a moment of recklessness, ordered the execution of a young Ontario immigrant named Thomas Scott. The news of this brutal murder raised a storm of indignation in the East. In a remarkably short time a volunteer force under the command of Col. Garnet Wolseley reached Fort Garry, only to find that the instigators of the rebellion had fled across the American border.

Out of the strife of rebellion arose a new province. Even while Wolseley's force was on its way up from the East, the Manitoba Act passed the Canadian Parliament. Manitoba was admitted into confederation as a full-fledged province. The claims of the half-breeds were fully met by a generous land grant. Many of Wolseley's men remained in the new province to share in its making. The little settlement about Fort Garry was soon transformed into the populous city of Winnipeg. Manitoba drew her first governor from the far East, in the person of a distinguished Nova Scotian, Adams G. Archibald.

A year later the westward expansion of confederation was continued. British Columbia became part of the Dominion, subject to a very important condition, namely, that a transcontinental railroad should be begun within two years and completed within 10 years from the date of union. In 1872, therefore, Sir John A. Macdonald introduced the question in Parliament. The great enterprise was well under way when the ministry, charged with corruption, was forced to resign. Alexander Mackenzie, who succeeded Sir John, proposed to construct the road gradually, as the finances of the country allowed. This delay put a severe strain upon British Columbia's loyalty to the Dominion. The Macdonald government, returning to power in 1878, immediately took up again the railway question. Construction was begun from both ends; and with such vigor was the work pressed forward that the last spike was driven by Lord Strathcona in November 1885. The completion of a transcontinental railway cemented the bond binding the East and the West.

No sooner was order restored after the Riel rebellion than settlers began to flock into Manitoba. Many farmers from eastern Canada moved west, while from Europe came an ever increasing number of colonists, of British, Scandinavian and German stock. The newcomers spread beyond the limits of Manitoba, many finding their way into the valley of the Saskatchewan, a few even to the foothills of the Rockies. This Northwestern Territory was governed by the lieutenant-governor of Manitoba and a council of 11 members. In 1876 a change took place. The eastern section of the country, called Keewatin, was placed under the personal control of the lieutenant-governor of Manitoba, while the western was given a resident governor and a council of five members. A few years later four districts were organized, Alberta, Assiniboia, Athabasca and Saskatchewan. Regina, being situated upon the main line of the Canadian Pacific Railway then under construction, was chosen as the seat of government.

The advent of the railway gave promise of peaceful and rapid progress, when suddenly a second rebellion broke out. At the close of the Red River rebellion many of the Métis withdrew westward and settled upon the banks of the Saskatchewan, among their near relatives, the Cree Indians. Here they were disturbed by the encroachment of a hated civilization. Their unrest was increased by a fear of losing their lands through the failure of the Dominion government to issue title deeds. The sudden return from exile of Louis Riel was all that was needed to provoke rebellion. Near Duck Lake, within the angle formed by the North and South Saskatchewan, the first clash took place, between a band of Métis and a force of mounted police and volunteers.

The position of the white settlers of the Saskatchewan Valley was serious. The real danger lay, not in a revolt of the Métis, but in the possibility of a general rising of the Indians, of whom there were over 30,000 in the Northwest. Prince Albert, Battleford and Fort Pitt lay exposed to attack. The most serious risings of the Indians took place near Battleford and Fort Pitt, among the followers of Poundmaker and Big Bear. The heart of the rebellion was the village of Batoche, the centre of the Métis settlements. The news of the fight at Duck Lake was the signal for an outbreak among Big Bear's warriors, who massacred the male inhabitants of Frog Lake and

1 Mount Sir Donald, and the Illecillewat Glacier, Selkirk Mountains 2 Lachine Rapids, St Lawrence River

then drove out the garrison of Fort Pitt. When the report of the rebellion reached Ottawa, the Dominion government took prompt action. The call for volunteers met with an eager response on all sides. In spite of the great distance, within less than two months 4,400 men were placed in the field, all save the Winnipeg contingent being from eastern Canada.

General Middleton, commander-in-chief of the Canadian militia, who arrived at Qu'Appelle in advance of the main force, made the Canadian Pacific Railway the base line of his operations, and prepared to crush the rebellion in all its centres at once. Three places were in immediate danger: Prince Albert, Battleford and Fort Pitt; three relief expeditions were provided for in the plan of campaign. General Middleton was to advance from Qu' Appelle to Batoche, Riel's headquarters, Colonel Otter from Swift Current to Battleford, and General Strange from Calgary to Edmonton. The three movements were successfully carried through, the divided forces converging upon Battleford. The bulk of the fighting fell to Middleton's column, which met with determined opposition at Fish Creek and Batoche. With Riel, Poundmaker and Big Bear finally in custody, the rebellion was at an end. Riel and eight Indians suffered the death penalty.

The rebellion was not without its good results. In recognition of their growing importance, the Northwest territories were granted representation in the Dominion Senate and House of Commons. The need of a stronger government in the Northwest became obvious. The old council was abolished and its place taken by an elective assembly, which first met in 1888, at Regina. But this was not of course a final settlement and in 1905 the vast district between Manitoba and British Columbia was divided into two self-governing provinces — Saskatchewan and Alberta.

The discovery in 1897 of rich deposits of gold in the Yukon (q.v.) was the signal for an influx of fortune-hunters. As a result the long standing dispute over the Alaskan boundary gathered new importance. In taking over Alaska from Russia in 1867, the United States secured all the rights of that nation as laid down in the treaty of 1825 between Russia and Great Britain. The interpretation of the terms of the treaty was left to a commission, composed of three representatives from the United States, two from Canada and Lord Alverstone, the chief justice of England. The commission met in London in September 1903. The decision was, upon the whole, favorable to the American claims. See ALASKAN BOUNDARY COMMISSION.

The growth of the West during the last 30 years has been very marked, the inevitable result of the expansion of the Canadian railway system and the resultant influx of settlers. Three railway systems now cross Canada from coast to coast: the Canadian Pacific (q.v), the Canadian Northern (q.v.) and the Grand Trunk Pacific (q.v.), the eastern section of which is called the National Transcontinental (q.v). These transcontinental railroads, with their branch lines, have opened up immense tracts of territory to the settler; and in addition a line is under construction from The Pas, on the Saskatchewan River, to Port Nelson, on Hudson Bay, a distance of 410 miles.

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11. THE SETTLEMENT OF THE CANADIAN WEST.— Without a just appreciation of the attractions and possibilities of the "Canadian West," as the larger half of the Dominion situated west of Lake Superior has commonly been called, neither the Canada of to-day nor that of the future will ever be understood. One of the first acts of statesmanship after the consummation of confederation (see CANADA — CONFEDERATION) was the purchase by the Canadian government from the Hudson's Bay Company (see CANADA — HUDSON'S BAY COMPANY) of the immense territory forming the basin of Hudson Bay and known as Rupert's Land, over which that company held proprietary rights. British Columbia, in 1871, entered the Dominion thus brought up to her borders. Some 14 years later followed the completion of the Canadian Pacific Railway (q.v.), an enterprise of splendid self-confidence in so young a country. A railway was needed to fulfil the conditions upon which British Columbia had joined the Confederation, and without it the vast territory between that province and Ontario could not be developed nor preserved to Canada. The purchase of Rupert's Land created the conditions which brought about and justified the building of the first transcontinental railway, and the prolonged discussions over the policy of the government of the day in respect to the public assistance given to that road began the process of popular education in eastern Canada in the extent and resources of the West. A seemingly limitless sphere for internal development gradually was revealed, and the necessity on two occasions for the employment of armed force against half-breed rebellions, with some sacrifice of blood, sealed the sense of possession. Pioneers proved the fertility of the soil and the richness of the mines, and with the assurance of a rapidly increasing population the whole national life received an access of vigor and hopefulness. External policy, as well as internal, was influenced. A country that could produce and export staple foodstuffs in quantities capable of indefinite multiplication, and had vast stores of timber, coal and metals could support great home industries and also become a prominent factor in international trade. It could work at home and bargain abroad. It could make choices. The idea of a trade union of the British empire, for example, presented itself in practical form largely because of the potentialities of the Canadian West. Population only was needed to show results, and the movement of population into this part of Canada is therefore a subject of interest and importance.

The country lying west and northwest of Lake Superior in Canada is of vast extent and great variety. It includes the extreme western end of the province of Ontario, the provinces of Manitoba, Saskatchewan, Alberta and British Columbia, while beginning again at the east and lying to the north of these districts are the Northwest territories and Yukon. Prior to 1905 the only provinces were Manitoba and

British Columbia. The remainder constituted the «territories.» Now «the territories» signify the vast northern region stretching from Labrador to Yukon. The land area in these districts in acres is:

District	Area in acres
Ontario (western end), approximate	20,000,000
Manitoba	41,169,098
Saskatchewan	155,092,480
Alberta	160,755,200
British Columbia	227,302,400
Northwest territories (Labrador to Yukon)	1,197,475,200
Yukon	132,113,280

For present purposes the northern territories, with the exception of Yukon, may be disregarded, since they have not yet attracted population to any marked degree. The western end of the province of Ontario is rich in timber and minerals, and possesses stretches of good agricultural land. The prairie region begins at the eastern boundary of Manitoba and extends to the Rocky Mountains, embracing the provinces of Manitoba, Saskatchewan and Alberta: wooded prairie and open prairie, rolling and flat, broken by hills and some rocky ridges and drained by great rivers that flow eastward and northward into great lakes with outlets into Hudson Bay. No richer agricultural lands and no better grazing ranges exist than are here found. Of the 350,000,000 acres in this combined district it would be idle to estimate the proportion of good grain land. It is very large, as attested by the successful farms now scattered throughout the whole region. In 1903 only 5,073,424 acres had yet been put under crop. By the year 1917 the area under crop had grown to 24,938,700 acres. British Columbia is a land of magnificent mountains rich in minerals, and of valleys of the very highest agricultural possibilities, nearly the whole clothed with splendid forests. See the articles in this series: AGRICULTURE; MINERALS; THE FORESTS AND LUMBER INDUSTRY.

In 1901 the Canadian West, not including the portion of Ontario, was shown by the census to have a population of 645,517. In 1911 the Canadian West, not including the portion in Ontario, was shown by the census to have a population of 1,742,182. Out of this number 498,347, or 28.6 per cent, had been born in the West, 354,748, or 20.4 per cent, had been born in the eastern provinces of Canada, 341,960 or 19.6 per cent had been born in the British Isles, 509,509 or 29.2 per cent had been born in foreign countries, while 37,618, or 2.2 per cent had failed to give their birthplace or been born at sea. By origin 966,238 were of British stock, 152,137 of German stock, 114,877 of Austro-Hungarian stock, 95,106 of Scandinavian, 83,635 of French, 43,676 of Russian and 32,167 of Chinese and Japanese, and in addition to these 78,717 were Indians and 108,905 of unspecified origin. To understand the peculiar nature and the rate of the movement of population into the Canadian West indicated by these figures, many general considerations must be borne in mind. Conditions as they have existed in the United States are among the most important of these considerations. Until the closing years of the last century the United States was an irresistible magnet. It drew from the movable population of all countries. From Canada itself it attracted a larger proportion of the native population than from any other country. Its relative advantages over Canada, in the eyes of those who sought to better their condition, consisted in its advanced stage of development. Not only were there more varied employment and larger opportunities in industrial and commercial life, but its fertile lands were opened up by railways from 10 to 40 years before those in the Canadian West and the mineral wealth of its western mountains was discovered and advertised to the world years before the riches of Canada in this respect were even suspected. The prairie regions of the Canadian West had to wait for transportation facilities, and then they had to wait until their profitableness was established. Since people are not predisposed to believe in the security of agriculture in northern latitudes, this meant, practically, that they had to wait until the prairies in the United States were tested right up to the border. Before that time even official crop returns could not be widely effective as inducements to immigration. Moreover streams of migration are not easy to divert. Where many have gone others tend to follow.

To what extent the United States drew upon Canadians up to 1900 is shown in the census returns of that year which record the residence in that country of 1,181,255 persons born in British North America, that is, in Canada and Newfoundland. How little the United States had given in return appears from the comparatively small number of 127,899 natives of the United States resident in Canada when the Canadian census was taken in 1901. But the flow of population from Canada to the United States has been checked and the tide has turned, and from census returns of 1 June 1911 it is shown that there were 303,680 natives of the United States resident in Canada, of whom 168,278 were males and 135,402 females; and during the years 1912 to 1917, inclusive, the immigration returns show the arrival in Canada of natives of the United States to a total number of 538,815. Canada has made steady and substantial progress and her industries now provide opportunities for all her own people who desire industrial employment. But what is of more direct importance to the present subject, the cheap, good lands in the United States are now very largely occupied; prosperity and a good birthrate among the farming population have created a host of land seekers of native birth, and the price of land has rapidly risen. In the Canadian West, on the other hand, millions of acres of the most fertile land are obtainable at moderate cost; this land has been proved, and railway facilities and railway rates put the crops within profitable reach of the markets.

The history of the settlement of the Canadian West may conveniently be divided into three periods: the first embracing the time before railway facilities existed or, say, up to 1885; the second from 1885 to 1901; and the third beginning in 1901. So far as the prairie division is concerned fur traders visited it and dwelt in it from early times, but no attempt was made at colonization previous to that of Lord Selkirk in the decade succeeding 1812. That his venture, beset with misfortunes though it was, left a permanent result was shown by the fact that in 1873 as many as 530 of the original Selkirk settlers or their white children were found to claim the grants of land offered by the Canadian Parliament. Other independent colonists had made their way into the country and there were, of course, the employees of the Hudson's Bay Company, but in 1869, when the purchase by Canada was made, the total white population numbered only a few hundreds. Some members of the military expedition of 1870 remained as settlers and other accessions were received at about the same time. In 1871 the Dominion government appointed the first immigration agents in the West, one in Manitoba and another in the Territories, and authorized the establishment of an «immigration shed» at Winnipeg, a hamlet then possessing 241 inhabitants. The work of promoting immigration to Canada had been undertaken by the Federal government in 1868, the provincial governments co-operating, and the appointment of agents in the West brought that section into direct touch with the general system having agents in Great Britain and Europe. It is interesting to note that in his annual report to the department for 1872 the agent at Winnipeg estimates the arrivals during the year at 1,400, of whom 954 came from Ontario, 78 from Quebec and 115 from the United States. During 1872 and 1873 the Dominion government entered into negotiations with a colony of German Mennonites living in southern Russia who desired to emigrate. Delegates visited Canada and in 1874 1,349 of these people settled in southern Manitoba. This is important, not only because it led to further immigration from the same source but also because the attention of the Dominion government was thus directed to the question of special colonization in the West. In 1874 Scandinavian and Icelandic delegates were shown through the country and a small beginning was made in Icelandic settlement through the moving up from Ontario of 285 Icelanders. The years 1874 and 1875 may be noted also because the Dominion government then first appointed Canadian immigration agents in the United States, chiefly for the purpose of effecting the repatriation of Canadians. Results were at once obtained and agents reported some 400 repatriated Canadians as immigrants into the West in 1876 and some 800 in 1877. In 1879 a delegation of tenant farmers of Great Britain visited the country and their reports resulted in an increase in immigration from the British Isles. The projected transcontinental railway had met with difficulties and delays, but in 1875 work was begun at Thunder Bay, the head of Lake Superior, on the section to Winnipeg, and in 1878 a line from the United States border at Pembina was completed to Saint Boniface, opposite Winnipeg across the Red River. Although the line from Lake Superior was not completed until 1883, the line from Pembina increased the facilities for reaching Winnipeg (q.v.), and the railway building combined with other not unnatural causes led to a «boom» in real estate, accompanied by a rush of speculators and prospective settlers. In 1881 the immigration agents estimated the arrivals in Manitoba at about 25,000, in 1882 at almost 70,000, and in 1883 at 50,000. Eastern Canada and the United States contributed the great proportion of these visitors, as most of them proved to be. The boom «burst» in 1883. By the census returns for 1881 some estimate of what was permanent in the immigration of the previous years can be reached. Manitoba was given a total population of 65,954, of whom 18,020 were born in Manitoba itself, and 6,422 in the Territories. Of these two classes 6,767 were Indians, but the half-breeds were not separately enumerated. From outside the largest number was furnished by the province of Ontario, namely, 19,125, Quebec supplying 4,085 and Nova Scotia 820. Natives of England and Wales numbered 3,457, of Scotland 1,836, and of Ireland 2,868. Russia supplied 5,651, chiefly Mennonites; Germany, 220; Norway, Sweden and Denmark, 121; and France, 81. The United States had contributed 1,752. In the same year the white population of the Territories was 6,974, of whom 517 were born in Ontario, 101 in Quebec, 98 in England and Wales, 136 in Scotland, 62 in Ireland, 27 in France and 116 in the United States. As the Canadian Pacific Railway was pushed through real settlement followed at a faster rate than ever before and in 1886 when the first train was run from Montreal to the Pacific Coast the net gain in population from the principal sources, over the figures just given for 1881, was: From Ontario 14,996, from Quebec 1,891, from Nova Scotia 497, from New Brunswick 363, from England and Wales 6,865, from Scotland 4,146, from Ireland 753, from Iceland 1,500, from the United States 570; while each of the other countries showed small gains. The chief sources of increases in the Territories were Ontario 8,300, Quebec 1,200, England and Wales 3,750, Scotland 2,000, and the United States 890.

It will not be necessary to follow in detail the records of the succeeding years up to 1901, which form the second period. The Canadian Pacific Railway Company, which had received large grants of land, became an additional agency in the organizing of immigration movements as also to a limited extent did the colonization societies which had purchased tracts of land in 1882, 1883 and 1884. A movement which began in 1889 and 1890 and ultimately attained considerable proportions was that from Austria-Hungary. The year 1890 was marked by a considerable immigration from Great Britain. Migration from the eastern provinces of Canada remained moderate until 1898. In 1899 over 7,000 Doukhobors were brought in and established in colonies. According to the census of 1901 Manitoba had a population of 238,934, not counting Indians and half-breeds. Those born in Canada numbered 164,582. Of the Canadians 67,566 were born in Ontario, 8,492 in Quebec, 1,536 in Nova Scotia, 820 in New Brunswick, 419 in Prince Edward Island and 167 in British Columbia. In England there were born 20,036, in Scotland 8,099, in Ireland 4,537, and in Wales 356; in Austria-Hungary 11,570, in Russia 8,854, in Iceland 5,403, in Germany 2,285, in Norway, Sweden and Denmark 2,090, in France 1,470, and in the United States 6,922. The Territories had a population of 185,335, exclusive of Indians and half-breeds. Of the 65,231 born in Canada, Ontario was the birthplace of 28,229, Quebec of 4,075, Nova Scotia of 1,169, New Brunswick of 669 and Prince Edward Island of 488. Those born in England numbered 10,752, in Scotland 4,226, in Ireland 2,158, and in Wales 186; in Austria-Hungary 13,407, Russia 14,585, Norway, Sweden and Denmark 2,462, Germany 2,170, France 1,023, Iceland 424 and the United States 13,877.

Before touching the movement of the later years into the prairie region a few words may be said of the progress of settlement in British Columbia. In 1901 the population of that province was 149,708, again excluding Indians and half-breeds. The composition of the population of British Columbia differs from that of the districts we have just been considering in several interesting respects. In the first place, it contained in 1901 relatively a larger number born in the United States, namely, 17,164. Then there were 14,576 Chinese and 4,515 Japanese. Ontario contributed 23,642, but Nova Scotia came next among the provinces with 4,603. These features are easily explainable. The chief attractions of British Columbia have been its mines, its forests and its fisheries. The first named have in many different years caused rushes from the United States and they have been an added attraction to the people of the province of Nova Scotia. The man from Ontario is a good pioneer under any conditions. And the same causes that drew Chinese to California have operated in the case of British Columbia. The first gold rush to British Columbia occurred in 1858, nine years after the memorable rush to California. It is said that between 20,000 and 30,000 prospectors from California invaded the province in that year. Systematic exploration, however, was not attempted and the mining population came and went in waves, the years 1858, 1861, 1864, 1865, 1869 and 1872 marking the influxes. Up to 1893 nearly all the gold produced was placer gold and the values ran from $705,000 in 1858 to $3,913,563 in 1863, continuing at an average of over $3,000,000 until 1868, when with variations a decline set in. The working of lode mines since 1893 has given an element of permanence to the mining population and the annual product of gold has for the past 10 years been between five and six million dollars in value. The copper, silver, zinc and lead mined exceed gold in their total value, copper in 1917 reaching the value of $17,784,494. Coal, of which British Columbia has enormous deposits, shows a steady increase and the annual product now exceeds 2,000,000 tons. In 1917 2,084,093 tons of a value of $7,294,325 were mined. The magnificent timber resources of the province have given employment to an increasing number of men and the yield of the fisheries has grown from $104,697 in 1876 to $14,637,346 in 1917. In 1871, when British Columbia became a province in the Dominion, the population was 36,247, of whom 25,661 were Indians. In 1881 it had increased to 49,548, in 1891 to 98,173, in 1901 to 178,657, in 1911 to 392,480.

The Yukon territory might perhaps be classed with British Columbia. In 1896 the gold discoveries were made there which caused the famous rush in 1897. The census of 1901 gave the Yukon a population of 24,357, exclusive of Indians and half-breeds. Natives of the United States numbered 6,707, of Ontario 1,940, of Quebec 1,349, of Norway and Sweden 1,265, of England 1,153 and of Germany 746; not specified 6,573. Pop. (1911) was only 8,512.

The part of Ontario included in the Canadian West has interests of its own in mines and fertile land, but its progress in settlement has been largely bound up with that of the prairie region to the west. The mines in the Lake of the Woods district caused the establishment of the town of Rat Portage, now Kenora, the continued prosperity of which, however, came to depend to a great extent on the lumber industry for the supply of the demand in Manitoba and the territories. Port Arthur and Fort William on Thunder Bay, Lake Superior, are at the head of lake navigation on the Canadian route, and the summer traffic in goods for the West and in grain and flour from the West is there transshipped, the towns possessing immense storage and shipping grain elevators. These towns are growing rapidly, particularly since 1901, and their growth will keep pace with the development of the West. The completion of the Canadian Northern Railway between Port Arthur and the wheat fields, running through the southern part of the province, has not only assisted Port Arthur but has opened up the valley of the Rainy River and new centres for the lumber industry. In 1911 Rat Portage, now Kenora, had a population of 6,158 people, Fort William 16,499 and Port Arthur 11,220. Since that date the population, especially of the two last mentioned towns, has greatly increased and new towns have sprung up along the line of the Canadian Northern.

The third period in the settlement of Manitoba and the Territories began in 1901. Conditions to which reference has previously been made had developed and the time was ripe. In the United States a greater movement of land-seekers was taking place than at any previous time, with the exception perhaps of the early eighties, and good available lands for pioneers were fast becoming occupied. This movement was not directly from the more thickly settled Eastern and Middle States to new lands, but from these States to the Northwestern and Southwestern States. The newcomers were willing to buy lands under cultivation at prices which were comparatively high to the men who had broken them. It was the men who had entered the Northwestern States as pioneers 10, 15 or 20 years before who were offered tempting prices, and in thousands decided to become pioneers again. This movement of population was directed by the railway companies and by private land companies, the managers of which had their connections in all parts and thoroughly understood the business of land settlement. The new feature in the history of immigration into the Canadian West in 1901 was the advent of these United States land companies. As soon as prospects seemed to indicate a good crop in that year, their agents appeared in considerable numbers and purchased large tracts. This continued in 1902. To show the magnitude of the operations it may be mentioned that one of these companies purchased in one block about 1,100,000 acres. The lands thus secured could be offered to land-seekers in the United States at from $4 to $10 per acre. In certain localities, or in the case of improved farms, the price was higher. The man who could sell his farm in the Dakotas, Minnesota or Iowa, for example, at from $30 to $75, or even $100 per acre was offered land in Canada, which returns showed was capable of producing more bushels to the acre, for a price which would not only pay the expenses of the transfer but leave him with a bank account. In most cases the large blocks of land purchased were sold in smaller lots to middlemen and the number of agents thereby largely increased and distributed. Enterprising Canadian land companies also existed and greatly increased in numbers. By 1903 the first phase of this new development, that is, the purchase of large blocks of land by speculating settlement companies, had almost come to an end. The policy of the government is opposed to selling except to the actual settler and the Canadian Pacific Railway Company, the Hudson's Bay Company and the Canadian Northwest Land Company, the other largest owners of land, were likewise unfavorable to the too extensive operations of speculative middlemen. It was to the interest of the railway company, particularly, to secure the actual settler as soon as possible and it was believed that prices could most effectually be kept at an attractive level by retaining the retail selling of the lands in the hands of the company. Large sales were, however, made by these Canadian companies in blocks as well as in farms, and it is of interest to note how great an increase in land values accrued as shown by the report of the land sales department of the Canadian Pacific Railway Company for the years 1901 and 1910. During the first year, a total of 831,732 acres was sold for $2,646,237, the average return being $3.18 per acre. In 1910, the sales of agricultural land aggregated 975,030 acres, for $14,468,564.33, being an average of $14.84 per acre. Included in this area were 145,421 acres of irrigated land, which brought $26.59 per acre, so that the average price of the balance was $12.78 per acre. The Canadian Northern Railway Company has also an extensive land grant, from which there were sold in 1910 246,966 acres at an average price of $10.36 per acre, compared with 116,662 acres for $1,091,722.37, an average of $9.36 per acre, in 1909.

Among the factors at work during this period, the immigration department of the government must be given a chief place. The number of agents in Europe and the United States had been increased and more money than ever before was spent in advertising Canada. In January 1904 the United States and Canadian land companies interested in western Canada and leading business men in Winnipeg and elsewhere organized what is called the Western Canada Immigration Association and raised a fund of $50,000 for a two years' campaign of education through the press of the United States. To this fund the Dominion government, the government of the province of Manitoba and the city of Winnipeg gave contributions. The effect of the increased immigration from the United States was not alone in additions to population from that source, but the fact that United States farmers were seeking Canadian lands was an excellent advertisement in Europe. The most telling advertisements of all, however, were the splendid crops of 1901 and 1902. The government returns of wheat, oats and barley for Manitoba and the Territories, now the provinces of Alberta and Saskatchewan, for the years 1900, 1901, 1902, 1910, 1915, 1916 and 1917 are as follows:

YEAR	Acres	Bushels	Yield per acre
	WHEAT		
1900	2,495,474	23,456,985	9.48
1901	2,516,532	62,820,282	24.90
1902	2,605,698	67,034,117	25.16
1910	7,867,432	110,166,704	12.73
1915	13,867,715	360,187,000	25.97
1916	14,362,809	242,314,000	16.87
1917	13,619,410	211,953,100	15.56
	OATS		
1900	833,410	16,654,322	19.98
1901	919,390	38,909,654	42.32
1902	1,035,427	45,139,455	43.59
1910	3,880,606	106,163,510	27.35
1915	6,480,681	279,692,000	43.77
1916	7,359,487	313,916,000	42.52
1917	8,559,500	254,877,200	29.78
	BARLEY		
1900	152,569	3,141,357	20.58
1901	215,711	7,331,255	33.98
1902	366,204	10,549,536	34.71
1910	667,171	12,057,806	18.07
1915	1,171,082	36,003,000	30.74
1916	1,391,296	33,419,000	24.02
1917	1,850,000	40,384,100	21.83

The area under wheat, oats and barley in what are now the provinces of Manitoba, Saskatchewan and Alberta was in 1900, 3,481,453 acres, and in 1917, 24,028,910 acres. The total production was, respectively, 43,252,664 bushels and 507,214,400 bushels.

For the year 1917, the field crops of the Dominion were as follows:

CROPS	Area (acres)	Bushels per acre	Total yield (bushels)	Total value
Fall wheat	725,300	21.50	15,533,450	$32,336,900
Spring wheat	14,030,550	15.50	218,209,400	420,701,700
Oats	13,313,400	30.25	403,009,800	277,065,300
Barley	2,392,200	23.00	55,057,750	59,654,400
Rye	211,880	18.25	3,857,200	6,267,200
Peas	198,881	15.25	3,026,340	10,724,100
Beans	92,457	13.75	1,274,000	9,493,400
Buckwheat	395,977	18.00	7,149,400	10,443,400
Mixed grains	497,236	32.50	16,157,080	18,801,750
Flax	919,500	6.50	5,934,900	15,737,000
Corn for husking	234,339	33.00	7,762,700	14,307,200
Potatoes	656,958	121.50	79,892,000	80,804,400
Turnips, etc	218,233	290.75	63,451,000	29,253,000
		Tons	Tons	
Hay and clover	8,225,034	1.66	13,684,700	141,376,700
Fodder corn	366,518	7.34	2,690,370	13,834,900
Sugar beets	14,000	8.40	117,600	793,800
Alfalfa	109,825	2.39	262,400	3,041,300
Totals	42,602,288	....	....	$1,144,636,450

The area in field crops in the Dominion increased from 19,763,740 acres in 1900 to 30,556,168 acres in 1910, and to 42,602,288 acres in 1917; and the total values of field crops from $194,953,420 in 1900 to $384,513,795 in 1910, and $1,144,636,450 in 1917. According to official estimates for 1916 the average value of farm lands in Canada was $40.95 per acre; the average wage of farm help (including board) was $43.23 per month for males and $22.46 for females, and per annum it was, respectively, $396.88 and $227.86. The total value of farm animals in 1916 was $903,685,700 as against $749,640,000 in the year previous.

Immigration.— The total immigration into Canada during the seven fiscal years, 1911–17 inclusive, was 1,620,312, of which 614,520 came from the British Isles; 659,705 from the United States and 346,087 from other countries. Of these 890,068 were destined to the eastern provinces and 730,244 to the west.

The growth of railways in Canada is indicated by the following table:

Year	Mileage	Year	Mileage
1850	66	1900	17,657
1860	2,065	1910	24,731
1870	2,617	1915	35,582
1880	7,194	1916	37,434
1890	13,151		

Of the 24,731 miles of railway in Canada in 1910, 9,473 or 38.3 per cent was in western provinces and in the year 1916 of the total 37,434 miles, 17,185 or 45.9 per cent was in the west.

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12. THE CONSTITUTION. In the Canadian draft of the bill, Canada was styled a «Kingdom.» For that title «Dominion» was substituted at the instance of Lord Derby, who thought that the title «Kingdom» might be offensive to the Americans. Sir John Macdonald, as a strong monarchist, deplored the change, feeling that had the title «Kingdom» been adopted the Australian colonies would have been applying to be placed in the same rank as the kingdom of Canada. As it is, the Australian colonies have adopted the title «Commonwealth,» suggestive rather of progress in democratic sentiment.

The term Confederation has been applied to two forms of polity materially different from each other. One is confederation proper; the other is nationality with a Federal structure. The instance of confederation proper in ancient history is the Achæan League; in modern history, instances are the original Swiss Bund, the United Netherlands, and the Union of the American colonies during the Revolutionary War. Instances of a nation with a Federal structure are the United States of America under their present constitution and the present Swiss Bund. A confederation proper is formed for a special object, usually that of common defense. The several states entering into it do not resign their sovereign power. Nor does the Federal council exercise, like a national government, authority over the individual citizen, but only over the States. Its legislative power is confined to the fulfilment of the special object of the federation. Nor has it any power of taxation, but only a power of requisition. In the case of a federation proper, the Federal government is an organ of the states governments collectively. In the case of a nation with a Federal structure, the states are severally organs of the Federal government. The Canadian confederation belongs, as its name Dominion of Canada imports, to the class of nations with a Federal structure. So does the newly formed Commonwealth of Australia.

The Canadian constitution is embodied in the act of the British Parliament called the British North America Act, which can be amended only by the power by which it was passed. In common with the other colonies, self-governed as they are styled, Canada remains in the allegiance of the British Crown, retains the constitutional forms and nomenclature of the monarchy, and is, to a certain, though of late years diminishing, extent, under the actual control of the Imperial government. The legislation of the Imperial Parliament is, with certain exceptions, binding upon Canada. To the King's government under the control of the Imperial Parliament belong the treaty-making power — with the exception of commercial treaties — and the power of peace and war. By the Imperial government the governor-general, the legal head of the Dominion is appointed. The supreme jurisdiction is still the British Privy Council, and in it is vested the interpretation of the Canadian constitution. The fountain of honor is Imperial. The territory of the Dominion is part of the domain of the empire, at the disposal of the Imperial government, which has exercised its power in boundary cases. The tendency, however, since confederation, has been constantly toward practical independence. The veto power has been very sparingly exercised, and only in special cases, as in that of copyright where the colonial act conflicted with the Imperial law. Appeal from the colonial courts to the Privy Council has been restricted. Military occupation has ceased. The military administration has passed, not without friction, into the hands of the Canadian Minister of Militia, and the Chief of the General Staff, as the principal military officer is called, is his subordinate. In commercial relations Canada is antonomous. The dispensation of titles and decorations, to which great influence is attached, still remains Imperial, though even in this the wishes of the Canadian government probably make themselves felt.

The Dominion of Canada and the other self-governing dependencies of the British Crown faithfully reproduce the forms of monarchy. The governor-general of Canada, as the representative of the British sovereign, has the prerogative of calling and dissolving Parliament, of appointing the members of the Privy Council, of nominating the Senate. Parliament is opened by him with a «speech from the throne.» But, like the monarch whom he represents, he reigns but does not govern. Very rare have been the instances since the confederation, and those not cases of general policy, in which he has exercised his personal power. Only of the pageantry of his office and of his assumption of state has there since confederation been an increase, favored by those who desire to foster the monarchical sentiment. The lieutenant-governors of provinces, nominally appointed by him, are really appointed by his ministers, and almost invariably from the ranks of their own party. When one of them was dismissed it was apparently against the wish of the governor-general and manifestly on party grounds; yet on reference to the home government the governor-general was directed to conform to the opinion of his constitutional advisers.

The legislative power is divided between the central legislature and those of the provinces, the subjects of legislation assigned to each being set forth in the Act. The exclusive legislative authority of the Parliament of Canada extends to (1) the public debt and property; (2) the regulation of trade and commerce; (3) the raising of money by any mode or system of taxation; (4) the borrowing of money on the public credit; (5) postal service; (6) the census and statistics; (7) militia, military and naval service and defense; (8) the fixing of and providing for the salaries and allowances of civil and other officers of the government of Canada; (9) beacons, buoys, lighthouses, and Sable Island; (10) navigation and shipping; (11) quarantine and the establishment and maintenance of marine hospitals; (12) the coast and inlet fisheries; (13) ferries between a province and any British or foreign country, or between two provinces; (14) currency and coinage; (15) banking, incorporation of banks and the issue of paper money; (16) savings banks; (17) weights and measures; (18) bills of exchange and promissory notes; (19) interest; (20) legal tender; (21) bankruptcy and insolvency; (22) patents of invention and discovery; (23) copyright; (24) Indians and lands reserved for the Indians; (25) naturalization and aliens; (26) marriage and divorce; (27) the criminal law, except the constitution of courts of criminal jurisdiction, but including the procedure in criminal matters; (28) the establishment, maintenance and management of penitentiaries.

To the provincial legislatures are assigned (1) the amendment from time to time, notwithstanding anything in the act, of the constitution of the province, except as regards the office of the lieutenant-governor; (2) direct taxation within the province in order to the raising of a revenue for provincial purposes; (3) the borrowing of money on the sole credit of the province; (4) the establishment and tenure of provincial offices, and the appointment and payment of provincial officers; (5) the management and sale of the public lands belonging to the province, and of the timber and wood thereon; (6) the establishment, maintenance and management of public and reformatory prisons in and for the province; (7) the establishment, maintenance and management of hospitals, asylums, charities and eleemosynary institutions in and for the provinces, other than marine hospitals; (8) municipal institutions in the province; (9) shop, saloon, tavern, auctioneer and other licenses, in order to the raising of a revenue for provincial, local or municipal purposes; (10) local works and undertakings other than such as are of the following classes: (*a*) Lines of steam or other ships, railways, canals, telegraphs and other works and undertakings connecting the province with any other or others of the provinces, or extending beyond the limits of the province; (*b*) lines of steamships between the province and any British or foreign country; (*c*) such works as, although wholly situate within the province, are before or after their execution declared by the Parliament of Canada to be for the general advantage of Canada or for the advantage of two or more of the provinces; (11) the incorporation of companies with provincial objects; (12) the solemnization of marriage in the province; (13) property and civil rights in the province; (14) the administration of justice in the province, including the constitution, maintenance, organization of provincial courts, both of civil and of criminal jurisdiction, and including procedure in civil matters in those courts; (15) the imposition of punishment by fine, penalty or imprisonment for enforcing any law of the province made in relation to any matter coming within any of the classes of subjects enumerated in this section; (16) generally all matters of a merely local or private nature in the province.

Powers not specifically given to the provinces are reserved to the Dominion, whereas under the American constitution powers not specifically given to the Federal government are reserved to the States or to the people.

The judges are appointed by the Federal government and, as in Great Britain, for life or during good behavior, in contrast with the practice of the United States, where judges are elected for a term of years. They can be removed only by the governor-general on an address from both houses of Parliament.

The Canadian Parliament consists, like the British, of two houses. The House of Commons, in which supreme legislative power practically resides, is elected almost by manhood suffrage; but by the Military Voters Act of 1917 the wives, widows, mothers, sisters or daughters of men who had served in the military or naval forces of Canada or Great Britain during the Great War were given the right of voting in the election of that year. The North America Act apportions representation to the several provinces on the principles of population and provides for decennial readjustment to meet changes in the balance of population. Members of both houses are paid; in Great Britain only members of the House of Commons. The senators are appointed nominally by the Crown, really by the head of the party in power, and almost invariably on party grounds. Senatorships are for life, not hereditary like seats in the House of Lords, so that the political analogy is imperfect. On the other hand, party which appoints the Canadian Senate, controls it. It might otherwise block legislation and there would be no remedial force, while the British House of Lords, it is well understood, must give way to the will of the nation when persistently declared. As it is, when the outgoing party happens to retain a majority in the Senate, there is danger of a block. The House of Commons is elected for a term of five years, subject, however, to the prerogative of dissolution. An amendment to the British North America Act was, owing to war conditions, passed in 1916 specially extending for one year the term of the Parliament then expiring.

The provincial legislatures are miniatures of those of the Dominion. The forms like those of the Dominion Parliament are monarchical, the lieutenant-governor formally nominating the ministers, as does the governor-general those of the Dominion. The practical working is popular, elective and partisan. The party divisions run through the provinces severally as well as through the Dominion at large. Quebec and Nova Scotia, like the Dominion Parliament, have each two chambers; the rest have only one. The Federal government has a veto on provincial legislation.

The treatment of the Northwest territories, as provinces, presents a certain analogy to that of the Territories of the United States, executive and legislative powers being given to a lieutenant-governor with an elective council subject to instructions by order under Federal council or by the Canadian Secretary of State.

The Parliament is by law bi-lingual; the French language as well as the English being recognized, though practically English prevails. The civil law, in which the *Coutume de Paris* and the Code Napoleon are blended with the common and statutory law of Great Britain, remains the law of Quebec.

In its generally democratic character the Canadian constitution approaches to that of the American republic, but in their structure they materially differ. The American constitution, in accordance with the principle laid down by Montesquieu (q.v.), separates the executive from the legislative. The members of the President's council, miscalled a cabinet, have not seats in the legislature, nor is their continuance in office dependent on its support. They are the nominees of the President alone. Under the Canadian constitution, as under the British, the members of the Cabinet have seats in the Parliament, on the confidence of which their tenure of office depends, and in which they initiate and control legislation. The head of the American republic is elected for a term certain. The terms of members and the times of election are fixed by law, whereas the Canadian Parliament is called in the name of the Crown by the Prime Minister, the head of the party in power, who wields in the interest of his party the prerogative of summoning and of dissolution. The members of the Canadian Senate are chosen by the head of the party in power, whereas the American Senate, formerly elected by the legislatures of the several States, are now (since 1913) elected by popular vote. Thus the Canadian constitution lends itself more aptly to the working of the party system of government, which, with all its accessories, political and moral, has prevailed, though the general influence of party cannot be stronger than it is in the United States.

In Great Britain the Cabinet, in which the real power of government resides, is a growth of political party unrecognized by law, while the Privy Council, recognized by law, has become honorary. In Canada the Privy Council is the Cabinet, at the same time conferring the honorary rank, but the relation to the Crown, the relation to Parliament and the working of the system in both cases are the same.

The British North America Act does not, like the American constitution, prohibit the establishment of a particular religion by the state. It leaves untouched to the Roman Catholic priesthood of Quebec the power of levying tithes on the people of their own communion. In the section respecting education it perpetuates the privilege of denominational schools. Since confederation the government of Ontario has practically aided a denominational university. But since the secularization of the clergy reserves and the opening of the University of Toronto, non-interference of the state with religion may be said to have been established as a general principle and may be regarded as practically part of the constitution. See the articles in this series: CONFEDERATION; LOCAL GOVERNMENT; IMPERIAL FEDERATION; UNDER FRENCH RULE; UNDER BRITISH RULE.

GOLDWIN SMITH.

13. LOCAL GOVERNMENT. Under the British North America Act of 1867, which is virtually the constitution of the Dominion of Canada, the organization of local government is placed within the jurisdiction of the several provinces. There is consequently considerable variety in the structure of rural and urban government in the different parts of the Dominion. Certain general features are, however, to be observed. The fundamental principle of organization is that of local autonomy by the means of representative elected bodies. The provinces are divided into counties, subdivided into townships, in which again school sections are formed. The county and the township are not everywhere found side by side. Indeed, the provinces of Canada present the same contrast between the predominance of the township and the county as is found in the United States. In Nova Scotia and New Brunswick the county is the unit of local government; in Ontario and Quebec both township and county are found; throughout the West the township system prevails, the county being only a judicial area. In addition to these rural areas of government, there are found incorporated villages, towns and cities. In Ontario and Manitoba incorporation takes place by virtue of a general statute; elsewhere it is done by special legislation. The details of local government may best be understood by first passing in review the organization and powers of rural governing bodies in the different provinces, and treating separately the question of town and city government and municipal franchises. Ontario, the most populous of the provinces, contains 38 county corporations and 423 townships. Both of these divisions vary greatly in size and population. The largest county (Grey) contains 1,092,027 acres, the smallest (Brant) only 213,905 acres. Thirty-two townships contain less than 20,000 acres, 11 of them more than 80,000 acres each. There are in addition the districts of Muskoka, Parry Sound, Nipissing, Manitoulin, Algoma, Thunder Bay, Kenova, Sudbury, Temiskaming and Rainy River, not yet organized as counties, but in the settled portions of which over 200 townships have been incorporated. The affairs of the townships are managed by a reeve and from one to four deputy reeves, according to population, elected yearly. For the county there is a county council, composed of the reeves and deputy reeves of the towns, not being separated towns, and of the villages and townships in the county. The franchise for all local elections is extremely wide. It includes every person of 21 years and upward, rated for real property to an extent varying from $100 in the townships to $400 in the cities; those assessed for an income of $400, and farmers' sons of full age living at home. The township council is chiefly concerned with the maintenance of roads and bridges, the levy and collection of school taxes and the collection of the county tax. Assessors appointed annually by the township council make a valuation of real and personal property. The other principal officers of the township are the treasurer and the township clerk. The latter, though legally holding office at the pleasure of the council, enjoys a practically permanent tenure. He prepares the collector's rolls, statute labor lists, voters' lists, etc., registers births, deaths and marriages and performs many other duties assigned to him by separate statutes. The county council meets at the «county town,» under the presidency of a warden whom it elects annually. It acts largely through committees, both standing and special. It appoints a treasurer, a county clerk, an engineer, a public school inspector and two auditors. The county council provides accommodation for the courts of justice, maintains county buildings, roads and bridges, houses of refuge, etc. The county rate is collected with the local taxation, but the county council has power to «equalize» the valuations of the local assessors if it thinks necessary. For organization of school districts, and control of schools in Ontario and elsewhere, see article on PUBLIC EDUCATION IN CANADA. Local government in the province of Quebec is organized under a municipal code enacted by the legislature (24 Dec. 1870), and revised in 1888. The larger towns and the cities are incorporated under special charters granted by the legislature. Of the counties some are divided into parishes, others into townships. For each county there is a council composed of all the mayors of the included municipalities. At its head is a warden (préfet) whom it annually elects. The county council meets in regular session four times a year; its duties consist chiefly in the construction and maintenance of roads, bridges, etc., the locating of the Circuit Court, provision against forest fires, etc. The subordinate local councils (parish, township, united township, village and town) consist of seven councillors elected annually throughout the province, each council having a mayor as its head. The powers of these minor councils extend to highways, bridges, ferries, regulation of public health, etc. For all local purposes direct taxes are levied on all real estate, except the property of the government and that of religious and educational institutions. (For organization, etc., of schools, consult article on PUBLIC EDUCATION). The Seigniorial tenure of land, which once carried with it certain powers of local administration, is also treated in a separate article. The local government of New Brunswick is regulated by a consolidated statute of 1898. Each county has an elected council, meeting twice a year. The larger cities have a representative in the county council as well as their own local council. The officers of the parishes are appointed by the county council. In Nova Scotia there are elective county councils, choosing its own wardens. Their by-laws are subject to the approval of the legislature. The counties of Prince Edward Island are electoral and judicial areas, but owing to the small size of the province the legislature itself acts as the organ of local government; villages and towns are, however, incorporated with elective councils. In Manitoba, Alberta, Saskatchewan and British Columbia local government centres in the township, administered by a council of four to six members, with a reeve at its head. The unorganized territories (Yukon, Mackenzie, Keewatin and Ungava) are controlled by the Dominion government, and have no representative institutions. The government in Canadian cities is regulated by statutes of the provincial legislatures. This fact permits of frequent change, and a continuous development of organization to meet the circumstances of the hour. In Toronto, for example, and in many other cities, it is the practice to suggest to the Parliament from year to year such alterations of the city charter as seem advisable. In the majority of the Canadian provinces, towns and cities are incorporated by special legislation; in Ontario and Manitoba, by virtue of general statutes on proclamation by the lieutenant-governor. Even in these provinces, however, special acts of incorporation are usually passed in order to provide borrowing powers. The typical form of Canadian urban government consists of a single chamber of aldermen (varying in number from 9 to 26) with a mayor. Both the mayor and council are generally elected for one year. In Montreal and Quebec the mayor is elected for two years, and in the latter city is chosen from among the aldermen. In Montreal, Quebec, Winnipeg, Brandon and Vancouver the aldermen are elected for two years. A board of control (the mayor with four aldermen), whose function it is to prepare the annual estimates, has been adopted for the cities of Ontario having a population of more than 45,000. In Montreal the affairs of the city are administered by the mayor and four controllers, specially elected for four years, the council of aldermen acting in a legislative and supervising capacity. Municipal offices are, in most cases, filled by appointments made by the mayor or the council. In the cities of Ontario and British Columbia, in Winnipeg, Charlottetown and Saint John, police appointments are made by commissioners independent of the civic government. The liquor licenses are almost everywhere under the control of the provincial authorities. The municipal suffrage in Canada is more restricted than the rural or parliamentary. Throughout Ontario, in Montreal, Quebec, Calgary and the four largest cities of British Columbia a special qualification of real property or income is demanded. The chief sources of civic revenue are found in taxes on real property, betterment taxes, and, in some cases, license taxes and percentage receipts from city franchises. Municipal indebtedness, incurred mainly for streets, sewers, waterworks and education, has much increased of late years, and in Montreal, Toronto, the cities of Quebec and the western provinces it grew rapidly from 1910 to 1917 concurrently with an amazing growth in assessment values. The net debt of Montreal at the beginning of 1917 was $97,790,779, of Toronto about $44,000,000. Except for waterworks there is but little municipal management of public works. Winnipeg, New Westminster, Three Rivers and a number of minor towns in Ontario own and operate electric plants; Calgary and Brandon operate their own street railways. Street railway franchises are granted for periods varying from 15 to 30 years; in Toronto, Montreal, Hamilton, Ottawa and Halifax the city receives a percentage of gross receipts.

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14. IMPERIAL FEDERATION. Imperial federation is the name given to the various projects for revising the relations between Great Britain and her colonies, so as to give to the latter a share in the government of the empire. The growth of the colonies, and the increasing burden of national defense, naturally suggest that the colonies should contribute to the Imperial revenue; on the other hand, such a contribution, unless accompanied by a voice in the councils of the mother country, would constitute that «taxation without representation» so abhorrent to Anglo-Saxon ideas. Such was the situation during the great controversy of the 18th century between Great Britain and her North American dependencies, and such is again the situation at the present day. Even in the 18th century various proposals were made for solving the colonial difficulty by admitting American representatives to the British Parliament. Governor Pownall (see POWNALL, THOMAS), Edmund Burke (q.v.), and Adam Smith (q.v.) made suggestions of this sort. But the difficulty of communication rendered any such federation impracticable. During the middle period of the 19th century it was currently believed that the manifest destiny of the colonies was independence. With the passing of that idea has arisen the demand for a closer bond of union. The Imperial federation movement originated in the early '70s, an informal conference for discussing the subject being held in 1871. In 1884 the Imperial Federation League was founded, its first chairman being the Right Hon. W. E. Forster (q.v.). Lord Rosebery (q.v.), the Right Hon. Ed. Stanhope (sometime Secretary of State for the colonies), and Sir Frederick Young (q.v.) (whose work, 'Imperial Federation,' had appeared in 1876) were interested in the movement from its inception. A significant event was seen in the London colonies conferences of 1887, to which representatives of both the self-governing and the Crown colonies were summoned, and at which the subjects of Imperial defense and trade were discussed. In 1892 a committee of the Imperial Federation League presented a practical scheme of federation. It recommended the institution of a council of the empire, to which delegates should be summoned from the self-governing colonies, the Crown colonies and India. The function of the council was to consist in the regulation of Imperial defense. It was recognized, however, even at this stage of the movement, that there was no sufficient unanimity among the members of the league in reference to the details of the plan to be adopted to enable them to work effectively toward a common end. The league, whose work was declared to be only preliminary and preparatory, was dissolved in 1893 and its place was taken by a number of organizations having each a more definite purpose. Of these the United Empire Trade League became the advocate of the commercial union of the empire by means of protective duties. The Imperial Federation (Defense) Committee urges combined action for defensive purposes, the establishment of a navy supported by joint contributions being its immediate object. Most important, perhaps, is the British Empire League, established in 1894 and extended to the Dominion of Canada. The program of the league aims at the permanent unity of the empire, the promotion of trade and inter-communication, the holding of periodic conferences and co-operation in national defense. In Canada, indeed, the movement had already made considerable progress. The Imperial Federation League in Canada had been formed at Montreal in 1885, with branches subsequently established at various places in the Dominion. Under the auspices of the organizing committee of the league a distinguished Canadian, George Parkin, delivered addresses throughout Canada, and in 1889 was sent, on behalf of the parent league, on a tour of the Australasian colonies. In 1894, at the instigation of the Canadian government, a conference was held at Ottawa to discuss intercolonial trade and communication. The Imperial government, Canada, Cape Colony and the Australasian colonies were represented. Resolutions were adopted in favor of reciprocal preferential duties among the colonies. A still more important conference was held in London in 1897 on the occasion of the jubilee celebration of that year. At this meeting the premiers of Canada, Newfoundland, New South Wales, Victoria, Queensland, South Australia, West Australia, Tasmania, New Zealand, Cape Colony and Natal discussed with the Right Hon. Joseph Chamberlain (q.v.), Secretary of State for the colonies, both the commercial and political relations of the mother country with the colonies. In reference to the former, a resolution was unanimously adopted favoring the «denunciation at the earliest convenient time of any treaties which now hamper the commercial relations between Great Britain and her colonies.» The premiers also undertook to confer with their colleagues to see whether a preference could advantageously be given by the colonies to the products of the United Kingdom. In reference to political relations, the majority of the premiers endorsed the following resolutions: (1) «That the present political relations between the United Kingdom and the self-governing colonies are generally satisfactory under the existing condition of things.» (2) «That it is desirable, whenever and wherever practicable, to group together under a federal union those colonies which are geographically united.» (3) «That it would be desirable to hold periodical conferences of representatives of the colonies and Great Britain for the discussion of matters of common interest.» From the first of these resolutions Seddon of New Zealand and Sir E. N. Braddon of Tasmania dissented, on the ground that the time had already come for a reconstruction of political relations. The Canadian government in the next year (1898) extended to Great Britain and to such British colonies as should reciprocate a tariff preference of 25 per cent, increased in 1900 to 33 1/3 per cent. In the summer of 1902, on the occasion of the coronation of King Edward VII, a further colonial conference was held between Secretary Chamberlain and the premiers of the self-governing colonies. The meetings of the conference, of which there were 10 in all, were also attended by several ministers of Australia and Canada then present in London, and by the members of the British Cabinet whose departments were concerned in the discussion. Chamberlain submitted a paper showing the disproportionate share of the burden of Imperial defense at present borne by the United Kingdom. «If you are prepared at any time,» he said, «to take any share, any proportionate share, in the burdens of the empire, we are prepared to meet you with any proposal for giving to you a corresponding voice in the policy of the empire.» No definite conclusion was reached for the alteration of present political relations beyond the following resolution: «That it would be to the advantage of the empire if conferences were held, as far as practical, at intervals not exceeding four years, at which questions of common interest affecting the relations of the mother country and His Majesty's dominions over the seas could be discussed and considered as between the Secretary of State for the colonies and the prime ministers of the self-governing colonies. The Secretary of State for the colonies is requested to arrange for such conferences after communication with the prime ministers of the respective colonies. In case of any emergency arising upon which a special conference may have been deemed necessary, the next ordinary conference to be held not sooner than three years thereafter.» On behalf of the Commonwealth of Australia £200,000 a year was offered toward the cost of the Australian Naval Squadron and naval reserve, from New Zealand £40,000 for the same purposes, from Cape Colony £50,000, and from Natal £35,000 for the Imperial navy generally, and from Newfoundland £3,000 for maintaining a branch of the Royal naval reserve. The grants were subject to ratification by the colonial legislatures. Resolutions of a general character in favor of preferential trade were also adopted by the congress. The Australian contribution met with sharp criticism from the Melbourne *Age* as involving taxation without representation. In February 1903 the British Empire League in Canada passed a resolution against the abstention of Canada from naval contributions, and declared that «it would be proper for her . . . to contribute a fair and reasonable share toward the annual cost of the navy of the United Kingdom.»

During the period that elapsed between the conference of 1902 and the outbreak of the European War the movement of opinion in regard to Imperial organization was very noticeable. It was especially stimulated by (a) the continued discussions of the question of tariff reform in England, which involved the possibility of preferential and reciprocal duties in favor of the colonies, (b) the increasing imminence of war with Germany which would necessitate a common effort of Imperial defense and (c) the periodic assemblage of the conferences which naturally called forth public discussion throughout the empire. Four distinct currents of opinion became more and more clearly defined in the ebb and flow of debate. One of these favored the retention, indefinitely, of the status quo. Another opinion of a kindred nature, which gained ground very rapidly with the progress of the century, favored the reorganization of the empire, not in the form of a centralized Federal state, but as a group of separate units in permanent alliance, no single body holding the sovereign power. This scheme is best set forth in Mr. Richard Jebb's 'Britannic Alliance' (1913). It may be said to represent the views during the period in question of Sir Wilfrid Laurier (consult Imp. Conference Report 1911, esp. pp. 122, 123) and of the South African party led by General Botha in South Africa, and of the Labor and Socialist parties throughout the empire. A third current of opinion revived the idea of Imperial federation in the sense of a central government with supreme power over defense and taxation. This view was supported by such influential leaders as the late Lord Grey (d. 1917), Lord Milner, Sir J. Ward, Premier of New Zealand, the late Sir Starr Jameson (the Dr. Jameson of the «raid») and others. It led to the formation throughout the empire of a powerful chain of affiliated associations known as the Round Table Group, organized originally for impartial study but leaning heavily toward centralization. The leading spirit of this movement was Mr. Lionel Curtis, who had been one of those instrumental in forming the Union of South Africa (1910) and who spent some years in visiting all self-governing parts of the empire to organize the Round Table Groups. On the basis of the work of the groups Mr. Curtis published in 1916 a volume called 'The Problem of the Commonwealth,' a brilliant presentation of the case for centralization. A fourth and last current of opinion, necessarily somewhat veiled, is that favoring the breaking up of the empire into independent states. This is presumably the goal of Mr. Henri Bourassa and the party of French Canadian Nationalists who follow his lead. (Consult Bourassa, 'Que Devons-Nous à l'Angleterre' (1915); 'National Problems' (1916), etc.). Independence is generally held to be the aim, proximate or distant, of the Nationalist party of South Africa headed by (General) Judge Hertzog. A proper appreciation of these divergent views enables one to understand the full significance of the great Imperial conferences of 1907 and 1911 and the subsidiary conferences of 1909 (consult Reports of Conferences, also Jebb, R., 'The Imperial Conference' 1911). The conferences of 1907 and 1911 showed a strongly marked divergence between the partisans of nationalism and those of federalism. The adoption of the name *Imperial* Conference in place of Colonial (1907) marks the opening of a new era. The proposal of a central body to be called the Imperial secretariat, advocated by the New Zealand and Australian delegates and those from the Cape and Natal, in 1907 was opposed by the (then) Liberal British government and by the Canadian delegates and those from the Transvaal. But it must be remembered that under the existing Cabinet system the delegates to the conference represent at a given time only one colonial party. In the place of a secretariat there was created a division of the colonial office known as the Dominions department, and the name «dominion» replaced colony in the official designation of the self-governing dependencies. In 1909 a special naval conference was summoned. A grave situation had been already officially declared to exist, by Sir Edward Grey as Foreign Secretary speaking in the House of Commons, and «emergency» offers of assistance had been made by New Zealand and Australia. In the conference of 1909 the principle of centralized control of maritime defense was abandoned in favor of a scheme of «fleet units» presented, perhaps reluctantly, by the Admiralty (consult Report of Conference, Cd. 4948). The conference of 1911 witnessed a pitched battle on the subject of Imperial reorganization, Sir J. Ward bringing forward a complete Federal scheme which was overwhelmed by the powerful opposition of Mr. Asquith (then British Prime Minister), Sir Wilfrid Laurier and their followers. The much-quoted statements of Mr. Asquith to the effect that Imperial responsibility cannot be shared, and of Sir Wilfrid Laurier «Canada need not necessarily take part in a British War» should be read in their context (consult Report of Conference). The conference left the Imperial situation still in the same dilemma (no taxation without representation and no representation without taxation) in which it had been since the Imperial Federation Movement began. Meantime certain definite steps were being attempted toward more adequate Imperial defense on the lines suggested in the conference of 1909. The Canadian government (Liberal) passed in 1909 a Naval Act for the creation of a separate Canadian navy. The incoming Conservative government (1911) repealed the Act, but found their own naval program (that of presenting dreadnoughts to the British government for an indefinite period) defeated in the Senate, that body being still Liberal. During the same period a separate «Royal Australian Navy» was brought into being, the principal ships completed during 1913 and the naval establishments at Sydney and elsewhere in Australia taken over by the Commonwealth (1 July 1913).

The advent of the war has obviously altered the whole situation. The war efforts of the dominions have been made entirely on a voluntary basis, the nominal legal sovereignty of the British Parliament not being brought into play. The consultations and conference, and especially the general Imperial conference of 1917, were devoted to the immediate aim of the prosecution of the struggle, the question of reorganization remaining in abeyance. But it is generally agreed that at the close of the war the time will have come for a reopening of the whole question of future Imperial relations. See the articles in this series: Since Confederation; Canada and the European War; Canadian War Economics; and consult in addition to the works noted in article above, Cunningham, 'Scheme for Imperial Federation' (1895); Goldman, C. S., (ed.) 'The Empire and the Century: a Series of Essays' (1905); Hurd, P., and Hurd, A. S., 'The New Empire Partnership' (1916); Keith, A. B., 'Imperial Unity and the Dominions' (1916); Parker, 'Imperial Federation' (1892); Silbourne, P. A. B., 'The Governance of Empire' (1910); Smillie, E. A., 'Historical Origins of Imperial Federation' (1910); Worsfold, W. B., 'The Empire on the Anvil' (1916).

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15. CANADA AND THE EUROPEAN WAR. Though the world at large was surprised by the outbreak of the great war, there was, in fact, for this little justification. Alarms enough had been given. In 1909 there was in England an acute crisis in regard to expenditure to meet Germany's naval preparations. The crisis extended to Canada, which was without either an army or a navy. Appeals were made in the Canadian Parliament that the country should put itself in a position to do something effective in case of a conflict. These demands embarrassed the government of Sir Wilfrid Laurier. His strength was in the French-speaking province of Quebec, where the people, detached for a century and a half from France, the mother-land of their race, and not stirred by the sense of unity with British ideals felt in English-speaking Canada, were disposed to make preparations only to meet the dangers of a direct attack on Canada. The most violent spokesman of this school of thought was M. Henri Bourassa, grandson of a former stormy leader in Canadian politics, Louis Joseph Papineau. When Sir Wilfrid Laurier submitted to Parliament plans for the creation of a Canadian navy, M. Bourassa attacked him as a jingo-imperialist. Like many others, Sir Wilfrid Laurier hoped that the dread of the horrors of war would lead to effective restraint by the more sober-minded people in Germany and elsewhere to prevent an actual outbreak. He proceeded reluctantly to spend money upon a navy and in 1911, when he fell from power, had gone no farther in concrete results than to create a naval college at Halifax and to purchase from the British government and to man two small warships.

During the election of 1911, M. Bourassa had assailed with great bitterness the policy of creating a Canadian navy as likely to drag Canada into imperialistic wars in which she had no vital interest. In the election, the Conservative party, though, in fact, imperialistic in spirit, had worked in a loose alliance with the anti-imperial Nationalists of Quebec. Conservatives had attacked Sir Wilfrid Laurier's naval policy but, unlike the Nationalists, on the ground that it aimed at too little rather than too much. When in power, with an adequate majority, the new Prime Minister, Sir Robert Borden, had to formulate his naval policy. To meet Nationalist demands, he rejected the naval policy of his rival, not on the ground that it was not needed but that it was inadequate. As a first step, and to show the earnestness and sincerity of Canada to give aid in the great crisis which he declared was near, he passed through the Canadian House of Commons in 1913 a measure providing for the immediate building, at a cost of about $35,000,000, of three dreadnoughts to be placed at the disposal of the British government until such time as Canada should have a navy of her own. This would, he said, give time to mature an adequate naval policy while she would meanwhile be giving effective assistance in naval defense. After prolonged discussion the Senate of Canada, which still contained a Liberal majority, rejected the new naval bill. Before this impasse between the House of Commons and the Senate had ended, war broke out on 4 Aug. 1914, while Canada was still without any naval equipment that would count in the great struggle.

It may be that this helplessness in regard to effort on the sea made the Canadian people the more zealous to equip a great army when once they realized the issues raised by the war. At any rate the outbreak of war was met in Canada by astonishing resolution and enthusiasm, to take part in what the Canadian people believed to be a vital struggle for liberty. It is a mistake to say that the motive was chiefly to help Great Britain. Help to Great

Britain Canada was most ready to give, but Canada did not enter the war as a child coming to the help of a parent. It was in the spirit of partners in a great crusade that the Canadians wished to join English, Scotch, Irish, Australians and others in fighting side by side with the French and other allies. No doubt it was due to Canada's political tie with Great Britain that her people saw so quickly the issue involved. They had no suspicion of aggressive designs on the part of Great Britain and thus met with quick sympathy her resolve, after the invasion of Belgium, to declare war. On the nature, however, of the issue itself and not through any compulsion to follow Great Britain, Canada fought. It was certain that, in time, the people of the United States would view the war exactly as the Canadians viewed it.

The outbreak of war saw stirring days in Canada. The Minister of Militia and Defense, General Hughes, later Sir Sam Hughes, had great energy and force, though he was attacked by critics for rashness in words and for ill-considered, impulsive and arbitrary actions. In the end these attacks led to his retirement. In his support it must be said that he brought a fiery enthusiasm and energy to his task of making preparations for war. Under his direction a military camp was formed at Val Cartier, near Quebec. When the war broke out few realized the long, desperate struggle that lay ahead and the Canadian government planned to send to Europe only a single division of 20,000 men, fully equipped for war. So eager, however, were the volunteers for service that by 7 Sept. 1914, a month after the outbreak of war, Canada had under arms 43,000 men. On 3 Oct. 1914, there steamed out of Gaspé Basin on the lower Saint Lawrence, escorted by a formidable array of warships, the greatest force which, as yet, had ever crossed the Atlantic. On board were 33,000 Canadian soldiers, most of whom, two months earlier, had been civilians with little thought of ever taking part in war. At the moment when this fleet sailed, the Canadian government announced the recruiting of a second division and, by April 1915, the movement to Europe of this force began. At the end of 1915 Canada had more than 200,000 men under arms. By this time it was clear that there could be no reserve in regard to Canada's participation in the war and that she was committed to the full extent of her men and resources. By the end of 1917 she had sent 400,000 men over-seas and was raising an additional 100,000. At the time of writing she has four divisions in the fighting line, her casualties alone amount to many more than the total number of men in the four first divisions which she sent over seas, and a steady stream of new men is still flowing to Europe, together with another and sadder flow of thousands of wounded and disabled men back to Canada from the battle-front. If the United States is forced to take part in the war on the same scale, the republic will send to Europe six or seven million men. Australia and New Zealand have sent an even greater proportion of their manhood.

It was one thing to send men across the sea, another to train them so that they should be able to take a worthy place in the battle line in front of the disciplined battalions of a military nation like Germany. For a long time the professional soldier had been contemptuous of civilian levies and the saying was often repeated that, for actual fighting, one trained soldier was worth more than a dozen of raw militiamen, with inexperienced officers, ignorant of war as a science. Remembering this, we can realize the anxiety, the fears and hopes, with which the unprofessional army was watched in Canada, when at last it reached the scene of war. The first Canadian division was sent to the front about Ypres, in Belgium, ground fought over the most bitterly, perhaps, of any part of the long front. On another front in the battle of Neuve Chapelle, 10 March 1915, Canadian artillery took part but not Canadian infantry.

The first great trial of Canadian arms was to come six weeks later. In April 1915, the resolve of the Germans was to force their way through to Calais and thus menace communications between England and France with greater effect than could be secured from Ostend, already for months in German possession. The Canadians were at a critical point on the line, in front of the villages of Saint Julien and Langemarck, near Ypres, in the defense against the advance of the German army to Calais. At about five o'clock in the afternoon of 22 April 1915, the Germans discharged poisonous gases, slowly carried by a favorable wind to the allied lines, and followed with an attack in great force. In the front line on the Canadian left were French regiments of Turcos and Zouaves. The deadly gas not unnaturally caused a panic among these troops and they fled to the rear in great disorder with the wild eyes and anguished, distorted faces of men who had breathed invisible death and were in terrible agony. With this support gone the Canadian left was «in the air.» Had the Canadian line broken, it is altogether likely that the German divisions, numbering 150,000 men, could have pressed through to Calais with all the dire consequences to the allied cause which this would have involved. The Canadian line gave a little. The left was bent back so that the two fronts were almost at right angles. For two terrible days and nights, fighting in shell holes and behind any defenses which the ground provided, the small force held on until adequate relief came. The Canadians lost 6,000 men, about one-third of all the Canadians then on the front, but they had baffled the enemy designs. «It is not too much to say,» wrote Sir John French, the commander-in-chief, «that the bearing and conduct of these splendid troops averted a disaster.» At Festubert (9 May) and Givenchy (15 June) the Canadians had further hard fighting. The three battles formed a terrible ordeal for troops hitherto untried.

The battle of Saint Julien, the name now generally used, and those which immediately followed are momentous in the history of modern war. They showed that newly-levied forces of good mettle can, after six or eight months of training, hold their own against the fiercest onslaught of professional armies. Not only so, but the training in initiative learned in civilian life made such men specially resourceful fighters. It was the Canadians who first kept enemy nerves on edge by trench raids and they proved good bombers, woodsmen, roadmakers and generally handy men as need arose. As we have seen there had been nervousness in Canada as to the bearing of troops on the battle-line who, officers and men alike, had been untrained civilians less than a year earlier. Saint Julien and the experience which followed relieved anxiety on this score and since that day Canadians, civilians and military alike, have had calm confidence in the capacity of the Canadian divisions at the front. During the first years of the war the chief command of the Canadian forces was held by an officer of the regular British army, at first General Alderson and later, from 9 May 1916, Gen. Sir Julian Byng. But at the time of writing the Canadians have been, since 19 June 1917, under the supreme command of Gen. Sir Arthur Currie, who, three and a half years ago, was a business man in the Canadian West. His success is one chief proof furnished by Canada of the rapidity with which, in conditions of war, the civilian soldier may become effective.

After the first trying test at Saint Julien, the Canadian army settled down to do its share in holding a part of the long line in France and Flanders. The three chief scenes of war in which the Canadian divisions took part were at Ypres; on the Somme, in the great offensive of the summer of 1916; and before Lens, chiefly in the fighting of 1917. In what is now known as the battle of Saint Eloi, on the Ypres line, beginning on 3 April 1916 and lasting many days, the Germans made a terrific concentration of artillery fire on the Canadians. There were three Canadian divisions in the line of battle. The hoped-for British advance did not succeed, in spite of local successes. The battle of Sanctuary Wood, in the same area, a terrible struggle, was fought in June 1916, and the Canadians held the ground after incurring fearful losses. The outstanding result of the long fighting was that the British continued to hold the Ypres salient upon which the Germans had concentrated their fiercest attacks. In September of that year the Canadian divisions were on the Somme where in many weeks of hard fighting their most conspicuous victory was at Courcelette. The Somme offensive was not the striking success which had been hoped for, but it was successful enough to cause a considerable German retirement in that region early in 1917.

While the Ypres salient will probably always be regarded as the chief battlefield for the Canadian troops during the war, the city of Lens is an objective for which they went through very hard fighting, after being withdrawn from the Somme. In the early spring of 1917 the British planned a great offensive and, by the fortune of war, the Canadian troops were in the hottest part of the attack. On 6 April 1917, the allied forces were cheered by the entrance of the United States into the war. Three days later, as if to celebrate it, they made the great attack at Vimy. Nearly 20,000 prisoners, 200 guns and some 300 machine guns fell to the British. The Canadians took part in the attack on the portion of the line called Vimy Ridge and captured 3,000 prisoners. It was then that Vimy became a great name in the military annals of Canada. The city of Toronto has undertaken, when the war is over, to restore the village of Vimy as a memorial of Canada's part in a striking military success.

By midsummer of 1917 the British had fought their way to points close to Lens and then prepared for a new offensive in that region. This took place in the last days of October and early in November. The most striking feat of the Canadians in this offensive was the capture on 6 Nov. 1917 of the strongly defended village of Passchendalle. This furnished the dramatic close to the Canadian fighting of 1917, beyond which the present record does not go.

Before the close of the year 1917 the Canadian casualties amounted to about 6,000 officers and 124,000 men. A good many of the wounded returned to the fighting line, but the list of final losses in the Canadian army makes a grim record. Exact figures are not yet available, but by the end of 1917 the dead, including those killed in action, dead of wounds or disease, and missing and counted dead, amounted to some 2,000 officers and 38,000 men, a total of 40,000 men — numbers slight compared with the losses of the nations in Europe, but yet appalling. To such great losses indeed must be added those of wholly or partially disabled men of whom the number must be nearly as many.

In spite of such losses, the war has had a stimulating effect upon Canadian character and production. For the first time in the history of the world a great army from America has fought in Europe to redress that balance of the Old World which, a century ago, England redressed in the new, by coming to the support of the Monroe Doctrine. It marks an epoch in the history of mankind that Canadian divisions, to be followed in 1918 by divisions from the United States, should thus fight in Europe in a cause in which neither of them had any thought of direct gain beyond their own security. "Nothing in the history of the world has ever been known quite like it," said a distinguished French general. "My countrymen are fighting within 50 miles of Paris . . . But . . . the Canadians at Ypres fought with supreme and absolute devotion for what to many of them must have seemed simple abstractions; and that nation which will support for an abstraction the horrors of this war of all wars will ever hold the highest place in the records of human valor." Precisely the same spirit brought the United States into the war. Facility of communication has made the whole modern world a unit. The idealism of the western peoples is practical, for, to each of them, danger and security alike involve a world-wide range of forces.

Not less on the material than on the moral side has Canadian life been stimulated. Canada has supplied vast quantities of munitions for the allied armies fighting in Europe and the skill and enterprise of her industrial leaders have made marked advances. In spite of the drain of war upon her male population, agricultural production has been increased and Canada remains one of the chief exporters in the world of food supplies. The enhanced value of her commodities has been so great as almost to counterbalance the cost to her of the war. For the first time in history the Canadian government has secured huge loans from the masses of the Canadian people. For the first time also Canada has a heavy trade balance in her favor, due chiefly to the export of munitions. It is an unexpected result of war that this former debtor state, borrowing large sums, has now become a creditor state financing great supplies of munitions for the Allies. See also SINCE CONFEDERATION (article 9).

The full story of Canada's part in the war has not yet been told. (For later details see WAR, EUROPEAN). The 'Canada Year-Book' published annually by the Minister of Trade and Commerce at Ottawa contains much statistical information. 'Canada in Flanders' by Sir M. H. Aitken, now Lord Beaverbrook (New York), is a semi-official account of Canada's part in the war. Two volumes have been published bringing the narrative to the end of 1916.

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15a. CANADIAN WAR ECONOMICS. In common with most commercial countries, Canada had enjoyed a period of remarkable expansion and prosperity, for at least 10 years previous to 1913. During this period her internal economic expansion and external trade increased in an exceptional ratio. This was chiefly due to the fact that Canada presented the largest remaining area of unoccupied lands and other virgin natural resources, under climatic and social conditions attractive to European and American settlers. With an influx of over 2,000,000 immigrants, accompanied by over $1,000,000,000 of foreign capital, it was inevitable that values, even on the soundest basis, should very rapidly increase, and equally inevitable, under conditions of free individual investment, that speculative values should rise still higher. The growth of western towns and cities in particular, and some of the newer railroad developments, outran the adjoining agricultural developments on which, however, they must ultimately depend. When, therefore, the optimistic spirit of investment which pervaded the older countries had received a check in 1912–13, and the pendulum began to swing toward greater caution in investments, many Canadian enterprises were caught in an incomplete or relatively unproductive condition. The sudden arrest of a number of these undertakings not only checked general speculation, but brought about a rather severe reaction in the older industries dependent on the regions of special expansions. These in turn checked enterprise in many other lines of trade. In brief, a period of stagnation and readjustment had set in during 1913–14.

Such was the condition of Canada when the European War burst upon the world. Naturally the Canadian situation was not improved by the initial paralysis produced by the declaration of war, and the dislocation of international trade. Within a few months, however, the demand for men and equipment relieved the growing stagnation of the labor market and stimulated those industries and trading houses which were able to furnish the various lines of army equipment, or could most rapidly adapt themselves to the new and urgent demands occasioned by the war. The rapid enlistment of many thousands of men involved the employment of many others in furnishing sustenance, equipment and transportation. The Canadian forces when equipped were rapidly sent overseas. The government, for the first time in its history, undertook to bear the whole expense of equipping, transporting and maintaining at the front its entire force. This involved very important consequences for Canadian trade and exchange, and, incidently, for the statistics of import and export.

The expansion of Canada for the decade from 1903–13 having been accomplished very largely through foreign capital, practically the whole of this capital came to the country in the shape of goods, thus enormously increasing the imports. Since, however, only a limited number of immigrants were at first employed in meeting their own primary wants, the feeding, housing and general maintenance of a rapidly increasing population made great demands upon the agricultural and other products of the country which would otherwise have been sent abroad increasing the export returns. Thus the epoch of internal prosperity and expansion of 1903–13 was marked by rapidly increasing imports, without any corresponding increase in exports. For the fiscal year 1912–13, the excess of imports over exports amounted to $298,750,000, on a total trade of $1,095,000,000. The sudden arrest of imports through the falling off of foreign investment and the corresponding release for export of much Canadian produce formerly required in the country rapidly readjusted the balance of trade. Within two years, including the first eight months of the war, the adverse balance of imports had been reduced from $298,000,000 to $36,000,000. Thereafter the effect of the war became very evident. Supplies for the maintenance of the men abroad, and the war equipment sent to them, so far as produced in Canada now appeared as exports. On the other hand, such foreign supplies as they were furnished with in Europe did not appear as imports to Canada. Taking the latest returns available, we find that for the 12 months, ending November 1917, the Canadian exports exceeded the imports by over $563,000,000 in a total trade of $2,586,000,000. In point of percentage this slightly more than reverses the exceptional excess of imports over exports before the war. Nothing more directly illustrates the remarkable revolution in Canadian external trade in passing from a condition of domestic expansion, through immigration and foreign investment, to the participation in a world war requiring the export of all available resources for the supply of the Canadian army and the needs of the Allies.

The great volume of Canadian recent aggregate trade was due chiefly to three factors, in addition to the central one already indicated. The first and most obvious is the great increase in prices, the usual accompaniment of war conditions. Second is the fact that the munition and other industries connected with the war have required the import of large quantities of machinery, raw materials and partly manufactured goods, which enter into the production of the finished articles as finally exported. The other factor is the greatly increased import, during the past two years, of articles of use and luxury for home consumption, due to the exceptional prosperity and spending power of that large section of the community which has benefited financially by the operations of the war.

This last factor is a rather interesting and important one, not by any means confined to Canada; but, in conjunction with the other forces, accounting for a very considerable element in the general increase in prices and the higher cost of living generally. As has been already pointed out, the first effect of the war was to aggravate the depression which the recent reaction from exceptional prosperity had produced, but the double demand for men, on the one hand to enlist for military service and on the other to furnish the supplies and services incidental to their participation in the war, led, before many months, to the absorption of all the efficient man-power of the country. The demand, however, being far from satisfied, not only did wages rise in all activities directly or indirectly connected with the war, but, to an increasing degree, other elements in the population, such as women and youths of both sexes, and elderly persons, found employment at hitherto unknown rates of remuneration. Thus, not only was the family income increased through its head, but often doubled and even trebled through the remunerative employment of several of its other members. Further, while over 400,000 men were taken overseas for military service, their families or those dependent on them were provided for by separation allowances, assigned pay and special contributions from the Patriotic Fund, while many of their relatives and dependents were among those who received extra employment, and, as was just and proper, in proportion to their qualifications, were given the preference in such employment. It goes without saying that those who were fortunate enough to control or have investments in munition industries, or other enterprises favorably affected by the war, receive as a rule profits and incomes much beyond what were customary, even in the days of expansion before the war. Some of these capitalists and merchants, it is true, have had to contribute various percentages of their gains through the war profits and income taxes, but the very volume of the taxes is an index of the exceptional revenue remaining with those who pay them.

It cannot be forgotten, however, that one considerable element in the community suffers more or less heavily from the war without any appreciable redress. This is made up of those living on fixed incomes or annuities, and certain professional or other salaries, which, for various reasons, have not been increased; also those furnishing services, or conducting various lines of business which have not been benefited by the war, but perhaps the reverse. Such persons, according to their previous social status, must meet the steady increase in the cost of living, and the many other calls upon their means without any offset. Their only resource is to continually curtail, as best they can, their former standard of living, while the majority of their neighbors are at the worst holding their own, but in most cases enlarging their expenditure.

With the government and its colossal expenditure, on the one hand, and hundreds of thousands of war-prosperous citizens on the other, competing for the products of agriculture and industry, it is inevitable that prices must soar, the volume of money and bank returns expand, and imports for domestic consumption increase not merely in value but also in quantity. Presuming that people indulge in luxuries only after the necessaries of life are secured in sufficient measure, and that even in the necessaries they may pass from lower to higher grades of quality, the Canadian trade returns for the past two years indicate that not only does the prosperous element in the country completely offset those who are forced to curtail their former scale of living, but rolls up a large balance on the other side. It is true that only certain imports can be cited in proof of this situation, inasmuch as, in many lines, the quantity and value taken for domestic consumption cannot be separated from the quantity and value taken for manufacturing purposes, or for reshipment to the troops overseas. Thus, only for the past two years have passenger automobiles been separated, in the trade returns, from all forms of automobiles and motor trucks; hence only for that time can one safely determine to what extent the increased import represents commercial or war needs as distinguished from personal use and enjoyment. So in the tobacco imports, it is impossible to accurately distinguish between the increased consumption in the country by a considerably diminished male population and the amount which is sent overseas to soldiers at the front. We must also recognize that much of what goes to the soldiers at the front is not sent directly from Canada, but furnished from Britain and France or purchased at the canteens, from funds contributed for that purpose. In the case of many other articles, however, whether of ordinary supply or of pure luxury, what the trade returns show, alike in actual volume of goods and in the money values of these, is that the actual as well as the relative purchasing power of the people has very greatly increased during the war. A few typical articles may be mentioned, the increased import of which will serve to indicate this interesting economic effect of the war. Boots and shoes, gloves, hats, various fancy articles, furs, glass ware, phonographs, piano parts and musical instruments generally, cheap pictures, precious stones, carpets, shirts, stockings, especially silk stockings, underwear, cottons, lace, embroidery, knitted goods, silks of all kinds for personal wear, tweeds, passenger automobiles, etc. The last is a typical case. Leaving values out of account we find that for the eight months ending November 1915, the total number of automobiles, including freight and passenger automobiles and motor trucks, was 4,887. For the next two years, taking the same eight month periods, the numbers of passenger automobiles alone were for 1916, 8,491, and for 1917, 12,156.

Notwithstanding, however, the increased expenditure of the Canadian people as a whole, a sufficient surplus of funds has been available from their incomes to enable them to raise, without any serious difficulty, increasingly large domestic loans for the use of the government in the prosecution of the war. The following have been the special domestic war loans effected by the government; in November 1915, $100,000,000, September 1916, $100,000,000, March 1917, $150,000,000, November 1917, $400,000,000. Large additional amounts have been supplied to the government in the purchase of war certificates and in special loans. Most of the increased capital for war industries has been supplied from within the country, while the banks have aided in financing British and allied purchases in Canada. There are also the loans for municipal and provincial purposes which have been largely taken up within the country.

As regards the direction of Canadian trade, it has been the good fortune of the country not to experience any appreciable dislocation of its normal trade connections since the outbreak of the war. Before the war nearly 90 per cent of Canada's export trade was with the two countries, Great Britain and the United States, and during the war that percentage has been practically maintained. Before the war 85 per cent of Canadian imports came from the same countries, and the only effect of the war has been to raise the percentage to a little over 90 per cent. At the same time, the details of the trade with these countries has naturally been considerably altered. There has been a very considerable diversion of the exports of Canada to Britain, and a corresponding transfer in the source of Canadian imports from Britain to the United States. When the war is over, therefore, we may expect very little change in the direction of nine-tenths of our world trade, beyond a readjustment of details as between Canada and her two chief trading allies. The loss of trade with the enemy countries has been of no material importance to Canada as a whole, though it naturally affected somewhat seriously a few trading houses.

As to the changes in the nature of the products called for owing to the war, it is to be observed that a veritable revolution has been wrought in one department of Canadian export, that of manufactures. Fifty-four million dollars represented the value of the export of the Canadian manufactures in 1913, increasing to $69,000,000 for 1914, $191,000,000 for 1915 and $440,000,000 for 1916; while for eight months to November 1917, the amount was $489,000,000. This of course represents munitions of war of all kinds and involves a correspondingly great increase in imports of materials and equipment which enter into their production. The usual allowance must of course be made for increased prices. Incidently the prosperity of the munition industries and their subsidiary dependents indicates the difficulty of inducing labor and capital to turn, during the war at least, from these tempting fields of sure profits and high wages to the more uncertain realm of agriculture. At the same time the next largest export has been in agricultural products, which, though less in aggregate value than manufactures, indicates a larger actual return from the point of view of the trade balance, apart from individual profits. The increase in agricultural exports has been due more to the proportion of certain products sent abroad, and the high values attached, than to an actual increase in the agricultural production of the country, which naturally varies with the harvests. The great harvest of 1915 has not been since approached. The exported agricultural products, apart from animal products, increased from $127,000,000 in 1914 to $364,000,000 in 1916, and for the eight month period to November 1917, amounted to $384,000,000. Next came animal products; increasing from $68,000,000 in 1914, to $117,000,000 in 1916, and $124,000,000 for the eight months of the past year. The export of the products of the mine, the fisheries and the forest have not materially increased for the past couple of years.

Altogether a close survey of the economic conditions in Canada, since the outbreak of the war, compels the general conclusion that, whatever reaction may require to be faced at the close of the war, whatever may be the subsequent effect of the great national debt which Canada in common with the other belligerent nations is piling up, and whatever readjustment may be necessary to meet the changed economic conditions and relationships of the outside world, the chief effect of the war up to 1918 has been to increase the prosperity of the Canadian people as a whole, to increase their command of ready money, and, in consequence, to raise, for large numbers at least, their physical standard of living.

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16. DIPLOMATIC RELATIONS OF THE UNITED STATES WITH CANADA.

The long Anglo-American peace, beginning in 1783, broken only once by a short period of war, and reinaugurated in 1814 by the Treaty of Ghent, is the more remarkable and significant because it has been maintained across the longest international boundary in the world without costly fortifications or armaments, in a period of national youth and aggressive westward movement, and in the face of repeated friction and irritation arising from a long series of international problems — many of which were serious in their nature and difficult of solution or adjustment, sometimes even threatening actual collision. In the war of the Revolution and in the negotiations of peace at its close the United States hoped to obtain Canada, but in the end was able to get only the region north of the Ohio which had been annexed to Canada by the Quebec Act (q.v.) of 1774 and was regarded as necessary for the future growth and safety of the Union. Great Britain rather reluctantly agreed to the water boundary through the lakes. The Canadians objected to this line of boundary and especially to the amputation of the territory north of the Ohio which under American control might be subject to conditions injurious to the Canadian fur trade and export trade to the Indians. They also desired to exclude the United States from the Saint Lawrence and all tributaries by making the boundary at the height of land, or at least to limit the size of American vessels upon the lakes.

The early British trade policy in relation to the United States was largely determined by a desire to stimulate Canada to furnish the British West Indies with American products carried via the Saint Lawrence, thus reversing geographic conditions with a view of attaching Canada to Great Britain.

Canada's remaining hope to continue the control of the interior Indian trade received its first shock by the American organization of the Northwest Territory under the ordinance of 1787 and the consequent plans of future roads and river improvements.

Serious questions and complications confronted the new American government which was inaugurated under the new Federal constitution in 1789. The boundary was unmarked. Influenced by Canadian traders who urged that the boundary should have been established south of the lakes, the British government still held the lake posts on American territory which it had agreed in 1783 to abandon without delay. British officers also seriously interrupted the fur trade of American citizens, by duties levied on American vessels and by the exclusion of American citizens from the navigation of the American side of the boundary waters, although at one time in 1790 Lord Dorchester suggested that the British government favored an alliance with the United States.

Washington, believing the retention of the posts prevented the possibility of securing a perfect tranquility of the Indians of the Northwest and fearing that the retention would result in retaliatory legislation against commercial relations with Great Britain, sent Jay to negotiate a treaty. This treaty provided for evacuation of the posts by 1796, freedom of intercourse and trade across the border and a commission to determine the boundary. In the United States this treaty was strongly opposed by certain citizens who advocated prevention of trade with Canada and were disappointed in failing to get egress of American vessels from the lakes to the Atlantic via the Saint Lawrence, and the prohibition of the importation of arms and warlike stores by way of the lakes.

The international boundary, although defined by the treaty of 1783, was not easily marked by the surveyors whose governments were not able to agree upon a starting point at the extreme eastern end of the line, and who encountered other difficulties all the way to the Lake of the Woods. Not until 1798, after 15 years of controversy, was the identity of the Saint Croix River determined, the agreement being reached through a joint commission as arranged by a provision of Jay's treaty, and this was the limit of progress made on the determination of the boundary before the War of 1812.

New sources of irritation on the lake frontier continued to arise. Canadians regarded the Louisiana Purchase as a step toward acquisition north of the lakes and, although they still attracted a large part of the Indian trade of the Northwest they induced the British government in 1807, in the negotiations of a treaty to replace the temporary provisions of the Jay treaty, to request an amendment which would admit their traders and the Hudson Bay Company to participation in the Indian trade of the Louisiana Purchase. By 1808, relations became much strained. Canadian traders asked redress for injuries resulting from exclusion from Louisiana, from American assessment of portage duties and from American interference with Canadian boats which had approached too near to particular American lake ports or shores.

Finally, the Indian troubles of 1811 aroused the American frontiersmen of the Northwest to demand the prevention of further relations between the Indians and the Canadian traders; and the lake frontier became the theatre of the principal military operations of the War of 1812, begun largely with the purpose of the conquest of Canada as a means of terminating British-American trade with the Northwest Indians and giving Americans control of trade on the lakes. See BOUNDARIES OF THE UNITED STATES.

One of the most important struggles in the peace negotiations which resulted in the Treaty of Ghent was to secure the continuation of American rights upon the lakes, where the British sought exclusive control, and upon the adjacent southern shores where the British by an ultimatum sought to establish an Indian barrier against future American aggression upon Canada. The boundary remained as before the war. The part of Maine occupied by the British during the war was returned. See GHENT, TREATY OF.

Meantime, there was an increase of American trade across the northern boundary east of Lake Ontario which was not stopped by the Embargo Act of 1808 nor by the later war embargo by which the Madison government sought to prevent trade with the enemy. The Treaty of Ghent, without mention of the ostensible causes of the war, provided for arbitration of various matters in dispute. It contained a provision for the definite establishment of the exact boundary line by joint commission. In 1817, as a supplement to the peace, to prevent the danger of future collision and sources of misunderstanding from rival navies on the lakes, an agreement was negotiated providing for mutual disarmament on those waters, except four vessels on each side restricted as to size and duties. Although peace existed in fact, there were many unsettled questions, some of which naturally became more important and more serious by the changes of time — influenced not only by development at the East but by the extension of virile peoples westward to the Pacific. The meaning and import of certain words, used in the treaty of 1783, relating to boundaries were still unsettled and continued a source of dispute between the nations for nearly 30 years. There were also new sources of irritation resulting from the war, and from economic and political policies. Canada could not forget that the closed war was an expression of an American policy of territorial absorption which had long been apprehended by Canadian authorities.

Among the most important subjects of disagreement or possible sources of friction were the ownership of some comparatively worthless islands in Passamaquoddy Bay, the northern boundary of Maine, the boundary through the lakes, claims for slaves carried by British war vessels during the war, other general claims, the use of the fisheries, questions relating to commerce with the British West India Islands, the restitution of territory taken during the war and the Northwest boundary. To these were later added the border troubles along the Maine boundary, the border troubles along the Niagara frontier at the time of the *Caroline* affair, the case of McLeod, trade relations with Canada, the use of Canadian canals, the operations of Confederates from Canada during the American Civil War, the connection of Canada with the *Alabama* claims dispute, the San Juan boundary, new phases of the fisheries dispute relating to the Atlantic Coast, the Bering Sea seal fisheries, the Alaska boundary, the obstruction or diversion of boundary waterways and the persistent question of reciprocity in trade relations.

Commercial relations were unsatisfactory. Although Great Britain by government regulations until 1822 allowed the privilege of trade enjoyed by northern New York and Vermont with Montreal and Quebec under the provisions of the Jay treaty which were extinguished by the war, she would make no new permanent agreement on the subject. She also refused to recognize the principle of the American claims to a natural right to navigate the Saint Lawrence to the sea. Fortunately the importance of the latter question was later diminished by the completion of canals which connected Lake Champlain and Lake Erie regions with the Hudson River, and thereby with the sea.

Commercial relations, as defined by the treaty of 1815, remained unsatisfactory until 1831 when the United States, after persistent efforts, obtained the privilege of trade with the British West Indies. Fishing rights were defined by a treaty of 1818 which also postponed a dangerous dispute by providing for joint occupation of distant Oregon until later provisions could be made for the adjustment of the boundary there. So, until new conditions produced the need of new adjustments, the people of each country fished together in the unsettled parts along Nova Scotia and hunted fur animals together in the unsettled territory bordering the Pacific Ocean north of the Columbia. At the same time the American claim to Oregon was reinforced by a provision of the Spanish (Florida) treaty of 1819, ratified in 1821, erecting the first international boundary line which touched the Pacific Ocean. The Passamaquoddy question was settled in 1817 by actual agreement of two commissioners, one selected by the King of England and the other by the President of the United States. The line of the northern boundary of the Louisiana Purchase was settled at the 49th parallel westward from the Lake of the Woods to the Rocky Mountains, in 1818. The boundary through Lakes Ontario, Erie and Huron was satisfactorily settled by two commissioners who met at Utica in 1822.

The claim for slaves carried away, referred after 1818 to the Emperor of Russia who made a compromise award, was later (1822) referred to four commissioners to determine the amount, and was finally terminated by the payment of a lump sum determined by the two governments.

The Northwest boundary question, the running of a line from the head of the Saint Croix along the highlands and the 45th parallel to its intersection with the Saint Lawrence, proved most difficult. In accord with the Treaty of Ghent it was submitted to a commission which toiled five years, 1816–21, only to reach a hopeless disagreement, the point selected for the "northwest angle of Nova Scotia" by differing opinions being 105 miles apart. By a subsequent convention of 1827 the question was referred to the King of the Netherlands, who in 1831 made a compromise decision which neither country would accept. By 1838, it reached an alarming stage in the Maine-New Brunswick controversy, coincident with the excitement of the Upper Canadian rebellion of 1837–38 and incidents resulting therefrom, including the dangers of lawless violations of American neutrality along the Niagara frontier illustrated by the case of the *Caroline* which for its unneutral service was seized on the American side of the Niagara by a small British expedition. Later, in 1840 it was further complicated by a new source of friction resulting from the arrest of Alexander McLeod, a Canadian deputy sheriff who was arrested on the American side of the river and tried for arson and a murder which had occurred in connection with the seizure of the *Caroline*. The acquittal of McLeod, in 1841, terminated a serious source of international embarrassment and smoothed the way for the friendly conferences between Webster and Ashburton who both exerted the wisdom of diplomacy to maintain peaceful relations. Finally, in 1842, after three years of great activity in search for the Northeast boundary, accompanied by a display of vast ingenuity in treaty interpretation, topographical theories and cartographic controversy, the question was settled by the Webster-Ashburton treaty which each country regarded as a capitulation. British-Americans who were debarred by the treaty from the most direct and practical line of railway communication between Halifax and Quebec long continued to feel that their interests had been sacrificed to an exaggerated fear of breach with the United States. The State of Maine which mourned the loss of jurisdiction, and Massachusetts which mourned the loss of lands in the disputed area, each received a solace of $150,000 from the United States government.

In 1846 the Oregon boundary question, which was an increasing source of dangerous tension between the two countries, was settled by the American acceptance of the British offer of the 49th parallel west of the Rockies, but reserving to the British-Americans all of Vancouver Island — a geographical exception which contained the germ of another boundary dispute which was settled in 1872. General claims of citizens of each country were submitted to arbitration by a convention of 1853, which provided two commissioners and an umpire or arbitrator chosen by the two. The commissioners in 1854–55 settled all claims successfully, and entirely satisfactorily to everybody except some who lost. It gave important decisions regarding fishery rights and rendered awards in the McLeod and Creole cases.

Meantime, for nearly a decade the conditions of international amity had steadily improved except in certain sections of the United States influenced by immigrants from Ireland who preached the antipathy aroused by O'Connell's agitation and subsequent Irish misfortunes.

From 1815 for nearly four decades, during which fishery and boundary questions were also prominent subjects of discussion, Canada persistently solicited commercial reciprocity with the United States. Finally, after the repeal of the English corn laws in 1846 and the repeal of the navigation laws in 1849, she expressed a growing sentiment in favor of closer relations, commercial and political; and many, both in England and America, seemed to consider that by her own consent she would ultimately be annexed to the United States. In 1850, certain Englishmen, interested in checking and diverting the trend of events, urged that the construction of Whitney's proposed railroad through the western part of the United States to the Pacific would result in the inevitable loss of Canada. In 1854, a reciprocity treaty was negotiated with the expectation that it would result in the gradual, quiet and peaceful settlement of the Canadian question by growth of close relations which possibly would develop into annexation; but conditions were soon changed with the rise of a protective tariff movement in Canada, under leaders who after 1859 affirmed the right of Canada to regulate her own tariffs without interference from England. In 1866, the reciprocity treaty was terminated by notice of the United States, partly under the influence of a feeling of resentment originating in certain Confederate operations from Canada during the American Civil War.

In the meantime, new conditions on the Pacific and west of Lake Superior threatened to complicate Anglo-American relations and finally induced the British government and Upper Canada to take steps to secure confederation and consolidation of the British-American provinces in order to counteract the danger of American annexation of the West. The later American acquisition of Alaska, which was regarded as a counter movement against British-American consolidation, contributed much to stimulate a determined Anglo-Canadian policy to complete the scheme of confederation by including British Columbia and the northwest territory of the Hudson Bay Company, and by opening a trans-Canadian railway to the Pacific. The latter was conceived as a Canadian counter-movement to frustrate American influence in British Columbia. In 1869–70, Irish Fenians threatened to complicate international relations by plans to invade Canada. In spite of the proclamation of the President, they persisted until their collections of money were exhausted and their intoxicated sentiment was sobered by a dawning consciousness of the seriousness of their project. At the same time Senator Sumner, influenced by Cobden's views of 1849 in regard to closer relations between the United States and Canada and especially stimulated by the question of the *Alabama* claims and by the danger of Fenian disturbances which were excited by the proximity of the British flag, proposed to remove all causes of international dispute with Great Britain by the withdrawal of the British flag from all British America, but his views were not sustained by Secretary Fish and the Grant administration. The Treaty of Washington, negotiated after the United States dropped her flag-withdrawal proposal, was a great landmark in the adjustment of international questions. It submitted to arbitration three disputed questions: *Alabama* claims, the San Juan boundary and the Northeastern fisheries. It also contained several clauses which directly affected subsequent relations between Canada and the United States. It established agreements in regard to bonded transit, certain features of the coasting trade, the navigation of certain rivers and canals (including the Welland and Saint Clair flats canals) as roads of commerce, and the use of the Saint John River by American lumbermen. It recognized the Saint Lawrence as forever free, and gave to Canada the right to navigate Alaskan waters. It failed, however, to renew the principle of the reciprocity treaty, which was requested by the British-Canadians and declined by the Americans. Although there was a marked improvement of international feeling, various controversies continued to arise at different times. Canadians complained because they did not get the free use of certain State canals which they supposed they had secured by the treaty of 1871. When Canadian authorities protested, the United States government replied that it had no control over State canals and could not compel States to act in the matter. Because in 1885 the United States refused to pass through the Sault Saint Marie Canal a Canadian vessel loaded with troops on their way to suppress the Riel rebellion, and because in 1892 President Harrison in order to retaliate for discriminating tolls on freights passed through this canal bound for Canadian ports, the Canadians were led to build a canal of their own on the other side of the river. Tariffs often ruffled the temper of the people on the border. Canada by various pilgrimages to Washington made persistent efforts to secure a renewal of the reciprocity treaty; but to these friendly advances the American government declined to respond with equal ardor, probably influenced largely in this policy of reserve by the fact that Canada possessed no treaty-making powers except through the British government. After 1873 the demand for protective duties became general among large classes of Canadian people. In the fall election of 1878 the protectionists were successful in Canada; and at the next session of the Dominion Parliament, a tariff was enacted. Since that time, both countries have found occasion to complain of new tariff bills. The American Congress placed duties on coal, lobsters, eggs, etc.; Canadian legislation excluded American cattle, and laid a retaliatory tax on lobster cans. Americans responded to Canadian retaliation by threatening to stop the transmission of goods in bond, and by new tariff provisions. New tariffs thereafter continued to be a source of more or less irritation. Incidentally, it may be stated that complications of threatening relations have often been largely the result of the necessity of indirect negotiations through the mother country, thus taking the feeling of responsibility from Canada who complains that her interests have been sacrificed by British diplomacy. A former Canadian official, summarizing the history of treaties affecting Canada, once said: «Like animals doomed to vivisection for the good of science, Canada has been unsparingly operated upon for the good of the Empire.» In 1887, the right of Canada to negotiate her own commercial treaties with foreign powers was conceded by Great Britain by a provision that negotiation of such treaties should be conducted by the British Minister and the Canadian envoy acting together and with equal powers. In 1890, the Canadian Dominion government, by its protest to the British Colonial office, prevented the execution of the Blaine-Bond reciprocity treaty between the United States and Newfoundland, and proceeded first through the British Minister at Washington and later through Secretaries Foster and Blaine, to renew previous efforts to secure commercial reciprocity.

Some more recent questions may here be sketched very briefly. The Bering Sea controversy, arising in 1886, finally found a way for settlement by arbitration in 1893. There still remained several questions for international negotiations, including protection of fur seals, the fisheries, the Alaskan boundary, reciprocity, transit questions, alien labor laws, mining rights and naval armaments on the lakes. An attempt to settle these questions was made in 1898–99 through a joint high commission, of which Lord Herschell was chairman, consisting of six members from each country. Although it practically reached an agreement on several subjects it made little progress on others (including reciprocity) and finally split and suffered shipwreck on the Alaskan boundary on which the Canadian commissioners demanded a settlement before they would enter into any agreement on other questions. Some one, perhaps with facetious intent, has explained the failure of this commission in contrast with the success of that of 1871 by stating that the latter contained only one Canadian and four English statesmen, while the former contained only one English and four Canadian statesmen. But the action of the Dominion members concerning Alaska does not seem strange to one familiar with the history of American-Canadian relations in regard to boundaries — a source of almost constant discussion, punctuated by bitter contentions, for over a century. Fortunately, in the case of the Alaskan boundary a temporary adjustment was secured by a *modus vivendi* effected in 1899; and after long negotiations, the question was in 1903 submitted to the arbitration of a joint commission of six "impartial jurists of repute" (three Americans, one Englishman and two Canadians) who settled it by a decision which perhaps may be regarded as a reasonable compromise.

For several years, the North Atlantic Coast fisheries threatened to disturb friendly commercial relations. The fishery agreement of the Treaty of Washington was terminated in 1885 by the required notice given by the United States in 1883, thus restoring the conditions existing under the treaty of 1818, and soon resulting in Canadian enforcement of irritating restrictions on the fishing grounds. In 1888, a *modus vivendi* was reached by an international commission (of three Englishmen and three Americans). This *vivendi* was continued both by Canada and by Newfoundland until the question was settled by The Hague tribunal in 1910, although Premier Bond of Newfoundland proposed to abrogate it after the failure of the Hay-Bond treaty in 1905. The chief remaining obstacles to friendly relations between Canada and the United States have recently been removed. Additional security for the future was made by the negotiation and ratification of an arbitration treaty in 1908, 11 years after the Senate had refused to approve a similar treaty. This treaty provides, with some restrictions, that differences of legal character, or relating to treaty differences which cannot be settled by diplomacy, shall be referred to the permanent court of arbitration established at The Hague in 1899. The settlement of the various points at issue had a fortunate culmination in the recent settlement of the fishery dispute by The Hague award. In conformity with the provisions of the treaty of arbitration, a special agreement of 1909 was arranged with the concurrence of the governments of Canada and Newfoundland, submitting to The Hague court of arbitration any question relating to the fisheries of the North Atlantic coast arising under the Treaty of 1818. The board appointed to consider the case contained six members, of which one was the chief justice of Canada and another a justice of the United States Circuit Court of Appeals, acting with an Austrian, a Hollander and an Argentine. The result seemed to satisfy both Canada and the United States, each of whom appeared to have won a victory.

Sources of future dispute have been lessened by a Waterways Treaty of 1909 which provides for the establishment of an international joint commission of the United States and Canada (a miniature Hague tribunal) consisting of six members (three appointed by each government) to exercise jurisdiction in cases involving the use, obstruction or diversion of boundary waters, and with authority to inquire and report on other matters of difference along the frontier or to decide upon such questions as may be referred to it.

The question of trade relations between Canada and the United States remains unsettled. The efforts of the United States to remove certain difficulties, arising from the passage of the Payne-Aldrich tariff bill of 1909 by the American Congress, resulted in the appointment of a commission and the negotiation of an agreement (January 1911) to secure restricted reciprocity by concurrent legislation at Washington and Ottawa. This agreement, which aimed at fuller and freer trade relations, and which after a sharp political struggle passed both houses of Congress, became the chief issue of a keenly fought campaign in Canada and was lost (September 1911) by the overwhelming defeat of the Liberal Laurier government which had held power for 15 years. The feeling of mutual respect and cordiality between the two countries has been strengthened by their conviction of common interest and by their practical co-operation to preserve the world peace against the attacks of Germany and her allies. See ALABAMA CLAIMS; ALASKA BOUNDARY COMMISSION; BERING SEA CONTROVERSY; BOUNDARIES OF THE UNITED STATES.

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17. PRIMARY EDUCATION. Previous to 1867 there existed in Canada four provinces, practically independent of each other. These were Ontario, Quebec, Nova Scotia and Prince Edward Island. These provinces especially Ontario and Quebec, differed very greatly. Speaking generally the people in Quebec were of French origin and spoke the French language. They were nearly all Roman Catholics. In Ontario most of the people were of British descent. The English language was the ordinary medium of communication. The great majority were Protestants — Anglicans, Presbyterians and Methodists being most numerous. When in 1867 confederation was effected, education was entrusted to each of the provinces, the Federal government merely retaining the right to introduce remedial legislation when rights or privileges of minorities were interfered with. Naturally, the systems worked out in each of the provinces differed in essential details — the governing bodies, the form of administration, the programs of studies and methods of instruction, varying to suit local conceptions.

Since 1867, five other provinces have joined confederation — New Brunswick, British Columbia, Manitoba, Saskatchewan and Alberta. These have in turn developed systems suited to their needs.

Education Free.— Generally speaking, primary education is free to all pupils of school age, that is, from 5 or 6 years to 18 or 21. In one of the provinces a fee may be charged, but this is merely nominal. In kindergarten schools and secondary schools, the payment of fees as supplementary to state, municipal, and district aid is sometimes permitted.

Central Governing Bodies.— In every case the system is administered by a central authority. In Prince Edward Island the board of education consists of the executive council, the principal of Prince of Wales College and Normal School, and the chief superintendent of education, the last-named officer being appointed by the lieutenant-governor in council. In New Brunswick the board of education consists of the lieutenant-governor, the executive council, the chancellor of the provincial university and the chief superintendent of education, who is appointed by the lieutenant-governor in council. In Nova Scotia the council of public instruction consists of members of the executive council, of whom five shall form a quorum, and the chief officer is a superintendent of education appointed by the lieutenant-governor in council. He is assisted by an advisory board of seven members, appointed by governor-in-council or elected by the teachers. In Quebec the council of public instruction consists of (1) the Roman Catholic bishops of the province, (2) an equal number of Roman Catholic laymen, (3) an equal number of Protestants. The last two classes are appointed by the lieutenant-governor in council. This council of public instruction is divided into two committees known as the Roman Catholic and the Protestant committee, each being concerned with the administration of schools of its own kind. The two committees may have associated with them persons chosen or elected because of expert knowledge. The practical administration of schools is carried on through a superintendent of education, who is appointed by the lieutenant-governor in council, and through two secretaries, one for each section of the council of public instruction. In Ontario the department of education consists of the executive council or a committee thereof, and the head of this department is known as the minister of education. The practical administration is conducted by a superintendent of education who is assisted by chosen specialists and specially qualified school inspectors. In Manitoba the executive council forms the department of education. One of the members of the executive council is known as the minister of education. Under his direction a superintendent of education and a body of specially chosen workers assist in the work of administration. An advisory board consisting of members chosen by the government, the inspectors and the teachers of the province, has authority in such practical matters as the framing of a program of studies, the certification of teachers, the authorization of textbooks.

In Saskatchewan and Alberta the form of government and administration is quite similar to that of Ontario. In British Columbia the council of public instruction is composed of the executive council, and the work under its direction is carried on by a superintendent of education. Recently steps have been taken looking toward closer co-operation among the four western provinces in all matters pertaining to elementary and secondary education and education of defectives.

Local Self-Control.— Though the governing bodies just mentioned regulate education as regards the organization, government, examination and inspection of schools, the certification and training of teachers, the authorization of textbooks and other matters of like importance, yet much power is given in most of the provinces to local school boards. Each district selects its own teacher, but must not take any one who has not a certificate to teach in the province. Within limits each district erects the building it considers most suitable under the circumstances and equips it as it may desire. There is wise supervision in matters of this kind to prevent undue expenditure and to guard against overcrowding of pupils, unsanitary conditions and lack of apparatus. In British Columbia the council of public instruction is supreme in all matters, virtually doing away with district control, except in the selection of teacher. In certain districts in Manitoba and Alberta the settlers are non-English and in some cases are not well enough acquainted with Canadian ways to organize and administer their own schools. A public trustee is appointed by the government to act in such cases, with the result that the schools and teachers' residences in these districts are fast becoming quite as good as any in the country.

The Religious Difficulty.— The constitution of the governing bodies in education indicates that there has been difficulty in establishing and administering school systems because of the conflicting religious beliefs of the people. A closer examination emphasizes this fact. In Quebec there are two systems of schools — one for Roman Catholics, one for Protestants. In Ontario there is a system of separate schools. In Manitoba, which until 1890 had Protestant schools and Roman Catholic schools, there is now but one system. There are in the province many schools conducted by religious communities. Some of these have regularly qualified teachers and are ranked as ordinary state schools, receiving a share of the legislative grant. In Winnipeg, and at other points, the Roman Catholic ratepayers support, at their own expense, an independent system of schools. In Alberta and Saskatchewan there is provision made for separate schools, but all schools follow the same program of studies, are under the same inspection and teachers must qualify in the same way. In Nova Scotia, British Columbia and Prince Edward Island the schools are strictly non-sectarian. The complaints arising from changes made in the school acts, especially in Manitoba, have led to prolonged controversies and interesting court decisions.

Religious Exercises and Religious Teaching.— Closely connected with the separate school question is that of religious teaching and religious exercises. In British Columbia, schools must be conducted on strictly secular and non-sectarian principles. No religious dogma or creed shall be taught. The Lord's Prayer may be used in opening or closing school. No clergyman of any denomination shall be eligible for the position of superintendent, teacher or trustee. In Manitoba, schools may close with the reading of the Bible without comment and the recitation of the Lord's Prayer, and it is possible for clergymen or their appointee half an hour before closing to give religious teaching to those of their own denomination. In Ontario every public school shall be opened with the Lord's Prayer and closed with the reading of Scriptures and the Lord's Prayer, or the prayer authorized by the department of education. Teachers who have conscientious scruples in this matter may be relieved. Attendance during religious exercises is not compulsory. Religious teaching may be given by the clergy or their representatives after the regular hours of school. In Quebec, in the Roman Catholic schools, there is daily prayer and systematic daily instruction in the catechism. In Protestant schools the first half hour is devoted to prayer, Scripture reading, instruction in morals and Scripture history. No denominational teaching may be given. A conscience clause is operative. In New Brunswick the teacher may open and close the school by the reading of Scripture and by offering the Lord's Prayer. In Prince Edward Island the school is opened with Scripture reading, but no comment or explanation is permitted. In Nova Scotia the law is practically the same as for the last two provinces, local option being permitted. In Saskatchewan and Alberta the school may be opened by recitation of the Lord's Prayer. Religious instruction may be given during the last half hour of the day, but attendance is not compulsory for pupils.

The Language Problem.— There has been not a little difficulty with regard to the language employed as medium of instruction in the schools. In Quebec, both English and French are officially recognized. In Ontario the school act provides that English shall be the language of instruction, except where this is impossible because of the pupil's unfamiliarity with the language. An attempt in 1912 and 1913 to make regulations covering this point led to a heated discussion. The famous "Ottawa case" was fought out in the courts. In Saskatchewan, Alberta and Nova Scotia those of French origin have special privileges, and in the first two provinces any language may be taught at the expense of the ratepayers concerned. But the medium of instruction in regular school hours is English. In Manitoba the Laurier-Greenway compromise made it possible, in any school where 10 or more pupils speaking any language were enrolled, for the parents to demand teaching in that language. This gave rise to what were known as bi-lingual schools with bi-lingual teachers. In some districts teaching in as many as four different languages could have been asked for, and in several schools teaching in three languages was demanded. In 1916 the school act was amended so as to do away with bi-lingualism as a system. English must now be the medium of instruction in all state-aided schools. This would not prevent French, German and other languages from appearing on the program of studies for elementary schools as they now are found on the high school curriculum.

The Support of Schools.— The schools of the Dominion are maintained by a fund drawn from three sources — a state fund, a municipal or county fund and a fund yielded from district assessment. The government aid is distributed in different ways. In Prince Edward Island and New Brunswick the grant depends upon the sex and the grade of certificate of the teacher. In Nova Scotia it depends upon grade of certificate and the number of days school is open. In Quebec the sum depends upon the population of the district, and in Ontario it is divided among the counties, townships, cities, and towns in a similar manner, special grants recognizing the grade of teachers' certificates and length of experience, and grants to rural schools recognizing school accommodation, equipment, teachers' certificates and experience and the municipal aid rendered the school. In Manitoba a definite sum depending upon the total grant available is given to each school open the full year, and a proportionate sum to schools open for less time. In Saskatchewan and Alberta the grant depends upon the size of the district, the number of days school has been kept open, the grade of certificate held by the teacher, and the percentage of attendance. In

Statistics Regarding School Attendance

	School	Teachers			Pupils			Average attendance	
		Male	Female	Total	Boys	Girls	Total	Number	Percentage
Prince Edward Island	474	162	426	588	9,514	8,555	18,009	11,170	61.8
New Brunswick	1,922	201	1,831	2,032	32,244	32,066	64,310	40,882	63.6
Nova Scotia	2,724	272	2,620	2,892	52,056	53,095	106,351	66,599	62.6
Quebec*	5,827	213	7,182	7,395	129,052	105,208	234,260	170,438	75.3
Ontario	6,548	1,028	9,918	11,546	252,302	241,636	493,838	319,337	64.6
Manitoba	2,688	474	2,390	2,864	......	....	93,954	59,778	63.6
Saskatchewan	2,966	1,732	3,408	5,140	62,061	56,206	118,927	*54,684	*55.1
Alberta	2,027	1,375	2,003	3,978	46,709	43,141	89,910	54,582	60.7
British Columbia	682	394	1,339	1,733	30,476	28,474	58,950	46,555	78.9

*1913

British Columbia the government meets practically all the expense of education except in the case of cities. Here a per capita grant is given, the smaller towns getting a higher rate than the larger cities. In Manitoba, Saskatchewan and Alberta no less than one-eighteenth of the whole land is set aside for school purposes.

The Salaries of Teachers.— In the older provinces, when free schools were introduced and districts began to be formed, it was natural that every settler should wish to be near the schoolhouse. This led to small school districts. When the burden of supporting the small district fell upon the small district there was a tendency to reduce the salary of the teacher to the lowest amount possible. The result has been most unhappy. In spite of excellent provision for the instruction and training of teachers it is now sometimes impossible to get as many who are fully qualified for their work as there are schools; and the male members of the profession are becoming fewer every year. This is particularly true in those communities where there is great industrial activity and consequent openings for men. Relief can come about in only two ways: (1) There must be an increase of legislative aid; (2) there must be increased local support. The former is probably an impossibility in some of the provinces because of the limited resources; the latter will come only as a matter of education. No people are in a better condition financially than the Canadian farmers. The burdens of taxation are comparatively light. Yet the salaries paid to teachers are very meagre. In Prince Edward Island the average salaries in 1910 ran from $146 to $289 for women, and $201 to $487 for men. In Nova Scotia the salaries vary from $562 for male teachers of the «B» grade and $358 for female teachers of the same grade, to $222 for males of «D» grade and $198 for females of the same grade. In Ontario the salaries average $711 for males and $483 for females. In Manitoba the average for all is $628 — an increase of $134 since 1902. In the new Province of Saskatchewan the rate in 1910 was $1,052 for males and $730 for females holding first-class certificates. In Alberta the similar average was $1,092 and $749 respectively.

Wherever salaries are small two things are noticeable: (1) The percentage of female teachers is large; (2) the percentage of trained teachers is small. In Saskatchewan very few of the teachers are untrained; in Manitoba conditions are almost equally satisfactory. In Nova Scotia about 43 per cent of the teachers have taken normal training. In New Brunswick where salaries are small less than 20 per cent of the teachers are men; in Nova Scotia about 18 per cent; in Ontario 24 per cent; in Manitoba 30 per cent; in Saskatchewan about 43 per cent. In the older provinces teachers' pension schemes are in operation and other provinces are considering the matter. The city of Winnipeg has worked out a very satisfactory schedule.

Training of Teachers.— The training of teachers is something to which all the provinces have given much attention, though the system followed is not uniform throughout. In Ontario and the four western provinces, the course was designed to be purely professional based on academic preparation in the high schools or university. It has not been found possible to adhere to this intention as there are always some branches in which academic instruction has to be given, such as history, geography, the school arts and the newer subjects on the elementary school program. In the eastern provinces the tendency is to combine academic and professional instruction as in American Normal schools. (See TEACHERS, PROFESSIONAL TRAINING OF; SCHOOLS, COUNTY TRAINING). In some of the provinces a short course of training followed by actual school room experience of a year or two, precedes the longer and more philosophic training. The fact that all certificates are granted by provincial rather than local authorities does much to elevate the standard of the profession.

Teachers' Institutes.— The work of the normal schools is supplemented by teachers' institutes which are of two kinds, (1) Those arranged for and carried on under the direction of the department of education; (2) those which are purely voluntary on the part of the teachers. These institutes do much toward developing a professional spirit, toward bringing teachers into touch with educational progress in other lands, and toward bringing school and home into closer relationship. The most important gatherings are the provincial conventions held each Easter. An attempt to hold a Dominion educational association has not met with marked success. Either the territory is too great or provincialism is too marked. Yet such an association could have great value. Such an association and a national bureau of education are two things that have yet to be worked out in Canada.

School Inspection.— In all provinces inspectors appointed or approved by the departments of education report on the conditions of the schools, not only to the central authorities but to the local school boards. In the cities superintendents are employed, and in some of the provinces their reports are accepted by the department of education. The inspectors or superintendents have to be professionally qualified in order to serve. In Canada the machinery of politics is not permitted to control school appointments.

School Libraries.—It is recognized throughout Canada that school libraries are a necessity in education. In most of the provinces grants are made to supplement the grants of trustees. The newer provinces have made the most complete provision by making it compulsory for trustees to spend annually a portion of the regular grant in the purchase of books for library purposes.

Coeducation.— A distinctive feature of Canadian elementary schools is the coeducation of the sexes. There are exceptions to this rule in Quebec and in a few leading cities of the other provinces. In all rural communities coeducation must continue to be the practice, and it is doubtful whether there will be any departure from customary procedure in cities and towns. The results morally and intellectually under present conditions seem as satisfactory as in lands where separation of the sexes is considered a necessity.

Consolidation of Schools.— In most of the provinces the School Act makes provision for consolidation of schools, but in Manitoba alone has the legislation been followed by considerable action. There are about 50 consolidated schools in operation, one operating in a school district of 120 square miles. The children prefer driving seven or eight miles to walking three miles. The idea is gradually gaining ground that it is easier and better to convey the children to the schools, than to bring the schools merely within walking distance of the homes. Consolidation can not include all the schools of a province. The little district school will always exist, but the influence of a neighboring consolidated school with its higher organization and better equipment will always urge to greater efficiency.

Compulsory Education.— In all the provinces with one exception education is compulsory. The acts are now enforced more rigidly than ever before. The openings in commercial and industrial life tempt young people to leave school early; some parents, particularly immigrants, are careless; and in many cases the distances from home to school are very great. Nevertheless the "percentage of attendance" is increasing from year to year, there are very few native born who cannot read and write and the incoming settlers are becoming more and more anxious to give their children the advantage of a school education.

Courses of Study.— The course of study pursued in the various provinces does not differ very greatly from that followed in other civilized lands, though emphasis may not be placed on the same subjects. Though direct moral instruction is not systematically given in all the provinces, it is doubtful if anything could be more salutary than the influence of the schools. The high moral standing of the average Canadian citizen must be attributed in a measure to the faithful labor and supervision of the public school teacher. In addition to the study of the five central subjects,— language, literature, mathematics, geography and history, — emphasis has of late been given to manual training (q.v.), and nature study (q.v.). The former branch received prominent notice owing to the liberality of one of Canada's most worthy citizens — Sir William MacDonald. The work in nature study is carried on successfully in several of the provinces and with excellent results. In the cities and towns particularly music and drawing are taught. The play impulse is recognized in the games of the school. In these the teacher frequently takes a prominent part. Many of them at summer schools and on school playgrounds have become acquainted with the method of organized play, and are capable of exercising skilled leadership. In most of the provinces provision is made for medical inspection of schools, not only in the cities but in rural districts. Physical training usually according to the syllabus of the Strathcona Trust is given in all the provinces. Cadet companies are numerous especially in Ontario. Instruction in hygiene is compulsory. The temperance wave in the Dominion is said to be owing in part to the teaching given in the schools in the use of alcoholic beverages. A great interest is being taken in rural schools in school-gardening and elementary agriculture, and this interest is on the increase. Vocational education is not attempted below the high school, unless the domestic science, sewing and manual training, given in the senior grades of the elementary school, be counted as such. It is generally recognized in elementary schools that the method of study, and the mental attitude developed in pupils, are of as much importance as the facts learned. The power for self-direction developed in Canadian youth, is amply proven by the behavior of manhood. The method of classification even in the large city schools, does not appear to have crushed out the individuality of the pupils. It may have removed idiosyncrasies, but it has still left power for independent action. The ideal of school government in Canada, though not fully realized in many cases, is that of a kindly authority which induces power of self-control. In this, the temper of the Canadian people is expressed. However, in the home as well as in the school, well-meant liberty often develops into license. Intelligence, right habits of thought, and good morals are often noted where manners and good taste are in a marked degree lacking. Yet on the whole the type of life represented in Canadian elementary schools is of a very high order.

Canada may be considered the land of the common school. With the one unfortunate exception already noted, there is nothing in the public school system which recognizes class, race or creed. The school is the most potent agency for unifying the diverse elements of the population. See articles in this series SECONDARY EDUCATION; HIGHER EDUCATION; CATHOLIC EDUCATION; PUBLIC EDUCATION. See also the section *Education* in the articles on the different provinces.

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18. SECONDARY EDUCATION. The public high schools of the English-speaking provinces have been modeled more or less upon those of Ontario, which was the first (1844) to organize a system of public instruction. As a result, there is a very general similarity amongst them. Quebec, however, which is largely French and Roman Catholic, with an English-speaking Protestant minority, has organized its high, as well as its elementary schools, in accordance with its exceptional conditions.

Secondary education in Canada is provided for in three main classes of schools which are well distributed geographically and are known sometimes by different names in the different provinces:

(1) Public high schools, in which secondary education alone is provided for. A few take up also the first year or the first and the second year work of the universities. Besides the day high schools, night and summer schools are provided generally.

(2) Public high school grades in connection with the elementary schools, known sometimes as construction, superior or intermediate schools. A few of such grades are as good as the smaller high schools, and often gradually develop into separate institutions.

(3) A small number of private secondary schools. These have usually elementary grades attached and occasionally do the work of the earlier years of the universities. Their fewness is due chiefly to the efficiency of the public systems, which were organized early in the history of most of the provinces. As, however, the wealth increases, more of such schools are established, but they are now, and will likely con-

tinue to be, comparatively unimportant factors in the education of the Dominion.

The public high schools differ markedly from those of the United States in being organized into one system in each province and in being controlled and supported by the province as well as by the locality. The causes which thus tend to uniformity in the individual systems have in most been reinforced by uniform examinations of the different grades, conducted by the central authority. The state-control is exercised by a minister of education, who is a member of the provincial Cabinet, or by a superintendent of education, responsible to the Cabinet, or by both. Sometimes such controlling officers have associated with them an advisory council, variously constituted, with more or less important powers. The functions of the state are legislative and general. Subject to this oversight, which is exercised both directly and through government inspectors and which prescribes textbooks, courses of study and school regulations, local boards of trustees or commissioners have complete control, appointing the teachers and managing the finances. The boards are thus able to deal with local conditions, while the state connection has secured a measure of uniformity and general efficiency of courses and standards. The state contributes often very liberally to the support of the public high schools, the expense of establishment and the rest of the expense of maintenance being provided for by local taxes imposed by the municipality or district in which the school is situated, and, with few exceptions, by the county. Sometimes small fees are charged, but the general tendency is towards free schools.

The private schools are generally proprietary and of denominational origin; and, as a result, nearly all of them are under denominational control. Although affected in their courses and organization by the denominating public systems, they have no connection with the state, except in the case of a few which are affiliated with state universities, or of some Quebec schools which are subsidized under certain conditions. Except also in Quebec, the public high schools are open to and attended by all denominations. The private schools, on the other hand, are usually sectarian, but the religious training given in most of the Protestant schools is such that they are patronized by the adherents of other churches than those with which they are connected.

All the secondary schools have more or less extended curricula, corresponding to those of the United States high schools; but, as there, the entrance and the leaving standards vary according to the system of organization, the efficiency of the elementary schools, the requirements of the universities, and the wealth and population of the different provinces. The Ontario secondary schools are the best developed and the most efficient, being, as regards standard, on a par with the best in the United States. Besides providing a general education, the Canadian secondary schools prepare for university matriculation, for commercial pursuits, for teachers' academic certificates and some of them for industrial and technical occupations. In one important and far-reaching respect they differ from the high schools of the United States: their teachers must all hold certificates of academic and professional competency, authorized by the respective State Departments of Education, and varying somewhat in standard and character according to the conditions of the system. Such teachers are usually obliged to attend professional schools. Ontario, however, is exceptional in providing for the professional training of its first class public school and high school teachers in two faculties of education: (1) in the University of Toronto (provincial), (2) and the other in Queen's University, Kingston. Both of these faculties receive provincial aid on condition that they provide courses approved by the Department of Education. In the other provinces the normal schools provide the general professional training for all grades.

Following are additional details in regard to each of the provinces:

Ontario.— The special secondary schools in Ontario are of two classes, high schools and collegiate institutes. The teachers are of two classes: those with ordinary certificates and those with specialists' certificates, each of the latter having taken an advanced course in his department. The principal of a high school or collegiate institute must be a graduate in arts of a university in the British dominions. The staff of a collegiate institute must consist of specialists with honor university degrees in classics, mathematics, moderns and history (including English), and science, and specialists in art and physical culture; and, where the optional subjects, agriculture, household science and the commercial subjects are taken up, with specialists in these departments also. The staffs of the high schools may consist of teachers with ordinary certificates, but many of them are specialists. Some of the collegiate institutes have as many as 35 teachers and only a few of the high schools have not more than two. Both classes of schools must have good accommodations with a minimum equipment of $750 for a high school with two or three teachers; $1,125 for one with four or more teachers; and $1,675 for a collegiate institute. A collegiate institute must have, and a high school may have, a gymnasium, for which the former may receive a maximum grant of $96 a year and the latter of $48.

A high school may be established by a county or a city municipal council with the approval of the minister of education, and such establishment entitles it to a maximum grant of from about $600 to $1,300, according to the grade of the schools, as well as proper maintenance by the county or the municipality in which it is situated. After providing for a minimum grant for each school, the rest of the legislative grant is distributed on the bases of the value of the equipment, the amount of the teachers' salaries, and the character of the accommodations, a system of apportionment which has been adopted generally and which has greatly stimulated local expenditures and has done much to secure the efficiency of the schools.

Some of the boards of high school trustees are separate from those of the public schools and others, called boards of education, have charge of both classes of schools as in the United States. In constitution, however, they are peculiar in containing a representative of the (Roman Catholic) separate elementary schools, if there should be any such school in a municipality (the large city of Toronto has two such representatives).

Besides the separately established high schools, there are in connection with the elementary schools, in localities which cannot maintain a high school, continuation schools which also do high school work of a character sometimes as good and as comprehensive as is done in many of the high schools. Continuation schools may be established with the approval of the Minister of Education by a public or a separate school board or by a union of such boards under conditions which ensure their proper maintenance. Of these schools, there are three grades: Grade A with three teachers, grade B with two, and grade C with one; of these, the grade B schools are the most numerous. The teachers of grade A schools must have the same qualifications as the teachers of high schools; those of grades B and C must hold at least first class public school certificates, many, however, being university graduates. The legislative grants to these schools are proportionately even more generous than those to the high schools, and as, being situated in the rural districts, they commend themselves strongly to the county councils, the support from this source is often proportionately larger than in the case of the high schools.

Pupils pass from the fourth grade of the elementary schools, called public or (Roman Catholic) separate schools (ages 12 to 14 or 15), into the secondary schools on uniform examination papers set by the department of education, the answers to which are read and valued by local boards. Permission, however, is granted to boards to set their own papers or to accept under certain conditions the promotion examinations of the elementary school staffs. The standard of entrance into the secondary schools in Ontario is at least as high as that of the best high schools of the United States.

A number of years ago, the department of education held uniform leaving examinations at the end of the courses of each main division of the secondary schools. As a consequence, however, of the evils associated with so much uniformity, these examinations have been discontinued and the department itself holds only those that are necessary for teachers' certificates. It continues, however, to conduct through a matriculation board, representing the universities of the province, the uniform matriculation examination prescribed by these universities.

The following statistics set forth the general condition of the high and continuation schools: Total number of high schools (1918), 162, of which 47 are collegiate institutes and 76 are free. Number of teachers, 1,051, of whom 763 are university graduates, and 507 hold honor degrees or the equivalent. Highest salary, $3,500; average for principals, $1,884; for assistants, $1,412. Number of pupils, 28,833 (1917). Total amount expended during the year 1916, $2,488,254, of which $1,509,227 was for the salaries of teachers. Cost for each pupil (on average attendance), $109.22. Total number of continuation schools (1918), 137, with 241 teachers, of whom 77 are university graduates. Highest salary, $2,000; average for principals, $1,117; for assistants, $778; total number of pupils, 5,082 (1917). Total amount expended for continuation schools in 1916, $306,148, of which sum $224,464 was expended for teachers' salaries. Cost per pupil (on average attendance), $82.09.

The public secondary school system is so efficient and so popular with all classes that there are only a few private schools. Of these the chief is Upper Canada College (which, however, is only semi-private), an old historic residential and day school at one time under government control, but now under a board of governors partly nominated and partly elected by the "Old Boys," the state connection being maintained through the Minister of Education, who is an ex-officio member. This college has still a small endowment, but is supported chiefly by fees. It does general and university matriculation work for boys, and is attended by pupils from all parts of the Dominion and even from the United States. Besides colleges for young women, some of which take up the same courses as the high schools, there are a few other colleges for boys, doing general work and that for university matriculation. Of these, the most important are Saint Andrew's College, Toronto; Bishop Ridley College, Saint Catharines; Trinity College, Port Hope, and the De La Salle Institute, near Toronto. A few also have mixed classes, the chief being Albert College, Belleville, at one time a university, but now affiliated with the University of Toronto (q.v.), which provides courses of various kinds and grades, as far as the end of the university work of the first year. With very few exceptions, all the private schools are connected with religious denominations.

The courses of study are the same for the different grades of public secondary schools: the general courses, the courses for admission to the professional schools for teachers, and the courses for matriculation into the universities. The evolution of the content of the general courses during the last 10 years has proceeded on modern lines; vocational and prevocational courses have been duly provided in connection with the high and continuation schools and in separate establishments.

There are 86 manual training centres and 84 household science centres attended by 14,130 boys and 13,552 girls from the fourth grade (seventh and eighth years) of the public schools and the first two years of the high schools. These centres are well equipped and liberal grants are made by the Department of Education on the usual bases: salaries, equipment, accommodations, with minimum fixed grants. In 1915 the total amount of the legislative grant was $30,200. In 1913 agriculture was introduced into the secondary schools as an optional course covering two or four years. At present 21 schools carry on the work, most of them, however, attempting only the two years' course. These schools also are generously aided by both the Dominion and the Ontario Government.

The Industrial Act of 1911 provides for a system of industrial and technical schools with courses as follows: Day schools: General industrial schools for subjects basal in the trades; special industrial schools for particular trades; technical high schools and high school courses; part time co-operative industrial courses for apprentices; schools for instruction in the fine arts. Evening schools for day workmen and workwomen.

The day and evening schools are liberally supported by legislative grants apportioned on the usual bases; the maximum grant on salaries for day schools being $5,000 and for night schools $3,000; on equipment for day schools, $2,000, and for night schools, $1,000. The maximum grant for co-operative classes is $875. The total attendance at the industrial and technical schools in 1917 was 16,668. In some urban centres large sums are expended on capital account; for example, at Hamilton a site for a new technical school has been bought at a cost of $75,000; Toronto recently opened a new technical school costing at least $2,000,000, and London has a new building for a technical school costing $250,000.

The day technical departments of the high schools adapt the ordinary courses to the vocational needs of the communities. At Haileybury, a mining centre, for example, the high school has a mining department in which, since its opening in 1910, 104 boys have been enrolled. And some of the technical schools have already courses nearly as comprehensive as those of the best schools in the United States.

The agricultural, commercial, and industrial and technical schools and classes are managed by advisory committees consisting of representatives of the high school and collegiate institute boards and an equal number of persons engaged in industrial pursuits approved by said boards. The advisory committees may also co-opt persons engaged in such pursuits who are not members of the school board. The proposals of such committees, however, are subject to the approval of the school boards concerned.

Quebec.— Secondary education in Quebec is organized on somewhat different lines from those followed in the other provinces. The Roman Catholic Committee of the Council of Public Instruction names the three chief kinds of public schools, respectively the «primary elementary,» «primary intermediate» or model, and the «primary superior» or academy. There are four years of work in the elementary schools, two in the model schools and two in the academies. The model schools and academies frequently teach also some of the lower grades. The majority of the Catholic model schools and academies are French, the others being English. Secondary education proper is that of the classical colleges.

There are three kinds of Protestant schools, namely, elementary, model, and academy, some of the last mentioned being designated «high schools.» Beginning in the year 1915–16 the Protestant Committee adopted a new classification of the grades as well as a new course of study. There are 11 grades, numbered from 1 to 11. The elementary schools teach the first seven grades, the model schools the first nine and the academies the whole 11 grades. Successful examination at the end of grade 10 admits to the Macdonald School for Teachers, for the elementary diploma course, and at the end of grade 11 to the model diploma course in the same institution. Grade 11 also affords matriculation to McGill and Bishop's universities. The principals of the chief Protestant academies are men. The Protestant model schools are practically «intermediate» schools. The academies are secondary schools proper, although including all the earlier grades.

Summarized statistics, 1915–16: Catholic model schools, 680; Catholic academies, 308; Catholic classical colleges, 21. Pupils in Catholic model schools, 108,475, of which 239 were Protestants. Pupils in Catholic academies, 83,227, of whom 339 were Protestants. Total of lay teachers in Catholic model schools and academies, 1,315. Total of religious teachers, 5,388. Protestant model schools, 58; Protestant academies, 41. Pupils in Protestant model schools, 5,416, of whom 334 were Roman Catholic. Pupils in Protestant academies, 12,038, of whom 356 were Roman Catholics. Total of teachers in Protestant model schools and academies, 602; of these 66 are without diploma, but in nearly every case the teacher is merely an instructor in physical drill, etc.

The courses of study in all schools are prepared by the Catholic or the Protestant committee, as the case may be, but the general school law of the province makes drawing and agriculture compulsory in all schools. Both of these subjects are extensively taught, and there is a director of drawing for the Catholic schools. An extensive program in household science has been carried out for several years now in some of the Catholic normal schools (Ecoles Normales Menageres), and the subject receives much attention in the convent schools. Manual training is practically confined to the Montreal schools. The Protestant school board of that city maintains also a large commercial and technical high school, at which the yearly attendance averages about 1,600. The technical schools proper of the province, the large ones at Montreal and Quebec particularly, come under the supervision of the provincial secretary, not under that of the Department of Public Instruction. The attendance at these two institutions is not yet as satisfactory as the splendid equipment and the qualifications of the staffs call for: the school at Montreal cost $636,187; that at Quebec $405,359. The Polytechnic School of Montreal, which has been in existence many years and which gives courses in engineering, architecture and the industrial arts, had an attendance of 140 in 1916–17. The teaching of agriculture in the Protestant and Catholic superior schools has received considerable impetus of late from the aid given by the county demonstrators (graduates of Macdonald College, Sainte Anne de la Pocatiere and Oka) in the form of lectures. In 1910 the Ecole des Hautes Etudes Commerciales (School of Commercial Higher Studies) was opened in Montreal. It is now affiliated with Laval University (q.v.). All the classical colleges are affiliated with Laval University and give the university courses in arts and science; and their students take university examinations, and receive the university degrees.

Manitoba.— The terms, intermediate schools, high school, collegiate department, collegiate institute and technical high school are used in Manitoba to denote secondary schools. Intermediate schools are secondary departments of graded schools, the principal devoting his whole time to secondary school work. High schools have two, collegiate departments three and collegiate institutes four or more teachers engaged exclusively in secondary school work. There were (1917) 72 intermediate schools, 23 high schools, 4 collegiate departments, 7 collegiate institutes and 2 technical high schools. The whole number of teachers in high and collegiate schools was 173, which with the 72 teachers in the intermediate schools gives a total of 245. In the intermediate schools there were, in 1916-17, 6,294 students of high school grade, of whom 4,096 were enrolled in high and collegiate schools and 2,198 in intermediate schools and the upper grades of rural elementary schools.

The secondary school program covers three years and includes several courses. The intermediate schools invariably give the course for teachers' certificates and occasionally that for university matriculation. In the high schools the student can pursue the teachers' course, the university matriculation course or a "combined" course, which admits to the university and to the normal school. In some of the larger collegiate schools a commercial course of two years is given in addition to the preceding. In certain rural centres a course is given in agriculture.

Special grants are paid by the Department of Education as follows: Intermediate schools, $200; high schools, $300 fixed grant, $8 per annum per capita grant and $50 for apparatus and library; collegiate departments, $450 along with per capita, library and laboratory grants; collegiate institutes, special grants to the amount of $1,600 in all in addition to capitation grant of $5 per pupil.

Principals of intermediate and high schools must hold first class certificates; principals of collegiate schools must in addition be university graduates; professional certificates are required in all cases.

The Winnipeg technical high schools, which cost over half a million each, were opened in 1912. So far as their day school work is concerned these are really manual training high schools, but as evening schools they are continuation schools for adult pupils along industrial and technical lines. Household science, art and physical culture are taught in both the day and the evening classes. In the day school there is a special course for girls, known as the practical arts course, which contains a maximum of work in household science and household arts and which leads to the normal schools. The percentages in the different courses in 1917 were as follows: Teachers' course, 20 per cent; university course, 19 per cent; combined course, 37 per cent; commercial course, 10 per cent; boys' technical, 4 per cent, and girls' practical arts, 8 per cent. The special work in household science and manual training is provided for students in the Collegiate Institute at Brandon and at Stonewall. The manual work of the technical schools of Winnipeg is recognized in the requirements for matriculation to the engineering course of the university, and it is probable that some allowance will be made for it in the other matriculation courses also.

Prince Edward Island.— There are no high schools proper in Prince Edward Island, but provision for the work has been made in about 29 schools with high school departments, in 32 graded schools and in some of the best conducted primary schools. In these grades about 500 pupils are prepared for entrance into Prince of Wales College and Normal School in Charlottetown (the capital) in a course which corresponds to that of the first two years of a high school. Properly speaking the college is the only secondary public school. All the other schools aim to matriculate pupils into it. All the schools are supported by legislative aid and district assessment, of which the former constitutes about three-fourths of the expenditure. No special grant is made for high school purposes. Whatever is paid extra comes by voluntary vote of the ratepayers of the district. Manual training, household science, physical culture and agriculture are taught in the Prince of Wales College and the Normal School. The teachers so trained, in turn instruct all the pupils in the public schools in physical culture and agriculture or nature study. Physical culture is greatly stimulated by prizes from the Strathcona Trust Fund and agriculture is assisted by the Department of Agriculture. With the exception of the Charlottetown and Summerside schools no instruction is given in manual training and household science.

New Brunswick.— Secondary education in New Brunswick is provided for in grammar and superior schools. The number of the former is 14, with 41 teachers and an enrolment of 1,281. Teachers holding license of the grammar school class receive from the government from $350 to $400 a year, according to the length of service of the teacher, and under conditions provided by the Board of Education, but not more than four teachers in any one grammar school can receive this legislative grant. These schools are free to all pupils in the county in grades 8-12. University matriculation examinations are based on the requirements of the high school course, as completed in grade 11. Superior schools may be established in every county — one for every 6,000 inhabitants, and a majority fraction thereof. The principal of a superior school must hold a first class superior license, and receives from the government a grant of $250 to $300 a year, according to the time of service of the teacher, provided the trustees pay the teacher a salary from the district at least equal to the government grant. Superior schools in grade 7 and upward are free to all pupils living within the parishes in which the schools are situated. Most of the superior schools provide courses in high school work of the same character as the grammar schools. Little progress has been made in secondary vocational education. There are five consolidated schools in the high school departments of which agriculture, manual training and household science are taken up. In most of the cities and towns these subjects are taught in grade 9; that is, the first year of the high school, and at the normal school. As yet, however, there is no provision for purely vocational training.

Nova Scotia.— In the public schools of Nova Scotia there are 12 grades, 9, 10, 11 and 12 being high school. Very many of the rural elementary schools have superior grades which do the first and the second year and even the third year work of the high schools. In the towns and larger villages the high school departments are separate. The law allows one high school, called the county academy, in each county, to share in the $10,000 which the legislature grants for secondary education, in addition to the other grants to which they are entitled in common with the high school grades generally; provided the county academy is free to each pupil of the county who passes the uniform departmental entrance examinations.

Should, however, the shire town fall below the standard in equipment and accommodations, another may be made the county academy by the council of public instruction. Besides the uniform entrance examinations the education department holds uniform examinations in the courses of all the high school grades, and the universities and colleges of the provinces accept for matriculation the certificate of having passed grade 11 when it indicates a high pass in the subjects they prescribe, or of grade 12 with a 50 per cent pass on the essential matriculation subjects. The grade 12 pass is expected to displace eventually the old grade 11 pass. There are 18 county academies with 59 teachers, of whim 39 are university graduates, class academic being the necessary professional qualification for the high school teachers drawing academic grants. In 1917 the total enrolment in all high schools was 9,088. Of the total attendance 1,853 belonged to the county academies. There were 2,949 pupils in the technical schools. Nova Scotia has a number of private schools which report an attendance of 450 as doing high school work.

Academic teachers must henceforth be graduates of *recognised* universities, who must after graduation have passed the provincial university graduates' testing examination in six subjects, one of which (the major) must be of the standard of university honors distinction. After 30 or 35 years' service they can retire with an annuity not exceeding $600 per annum.

So far, except in some progressive centres, very little special attention has been paid in the secondary schools to vocational education. Art is an optional subject in the high school course and in the Halifax County Academy there is a three years' commercial course. In the Nova Scotia Technical College there are two sets of courses, the long course being of university grade and the short course partly of secondary grade. There were also in 1917 local technical schools in seven cities and towns and coal mining and engineering schools. For the school year ending July 1917 the following was the attendance at the different classes of schools: Rural Science School, 148; Agricultural College (regular), 63; Agricultural College (short course), 290; Nova Scotia Technical College, 67; evening technical schools, 1,643; coal mining schools, 536; Normal College, 263; total, 2,949.

Alberta.— The administrative unit of the educational system of Alberta is the school district. Any district, when conditions warrant, may, in addition to providing for the elementary or public school grades (1–8), provide for any or all of the high school grades (9–12), with the usual secondary school courses, all being under one school board. The government provides an increased grant for the secondary grades. Grade 11 gives university matriculation standing and admits to a normal school for training as second class teacher, while grade 12 gives first year university standing and admits to normal school for training as first class teacher.

Provincial normal schools containing large practice schools are located at Calgary and Camrose. The other educational institutions which take up secondary school work are the Alberta (Theological) College, the Robertson (Theological) College, the Jesuit College, all of Edmonton; Mount Royal College; Western Canada College; Saint Hilda's College, all of Calgary; Alberta Ladies' College at Edmonton; and Knight's Academy at Raymond.

As in most of the other provinces, the vocational side of education is emphasized in Alberta. The board of every district has power to make provision for instruction in both the primary and secondary grades in manual training, domestic science, physical training, music and art, and courses are given during each summer vacation for teachers of these subjects. An optional commercial high school course of two years has also been established. As to agriculture: The subject is taken up in the last two years of the elementary school course and is supplemented in the higher grades after a course in elementary science; and summer schools are provided for both teachers and inspectors. Moreover, in order to provide for very many young men and women who in their earlier years were deprived of school facilities, three schools of Agriculture, managed by the Department of Agriculture, have already been located on three of the demonstration farms of the Department of Agriculture. The courses include scientific and practical agriculture and household science and art, along with the more essential subjects of the ordinary public and high school grades. Pupils who take the two years' course offered, and who possess the necessary academic standing, may continue their course for a degree in agriculture in the University of Alberta.

In some of the larger centres technical schools have been established whose courses cover a wide range of industrial trades. Night schools have also been established, especially in the mining centres. In order also to correlate efforts in these various directions and to afford opportunities for more advanced training, an institute of technology has been established at Calgary.

Saskatchewan.— Since the passing of the Secondary Education Act in Saskatchewan in 1908, 21 high schools have been established, 7 of which have since been raised to the rank of collegiate institutes. In these, 138 teachers were employed in 1916 and the total number of pupils was 3,849. A residential college for boys and girls has been established by the Methodists in Regina and one for boys by the Presbyterians in Moose Jaw.

The total outlay from general revenue in aid of education increased from less than $200,000 in 1904 to approximately $1,000,000 in 1916.

Being a comparatively young province, Saskatchewan has been devoting most of its energy to its public schools. It has, however, made a beginning in elementary industrial training. A board of any district has authority to provide for manual training, household science and industrial training in both day and night schools. The only secondary schools, however, giving courses in these subjects are the collegiate institutes at Regina, Moose Jaw, Prince Albert, Saskatoon, Yorkton, Weyburn and Swift Current. As Saskatcheman is almost purely an agricultural province, special stress is being laid upon agriculture in both the public and the high schools. So far not much has been done in the latter, but the indications are that a majority of them will provide for the subject in the near future. For commerce and the trades little provision has so far been made in the secondary schools. Three collegiate institutes, however, have been giving exceptionally good courses for a number of years. There is very close co-operation between the Department of Education and the University of Saskatchewan; especially valuable work has been done through the medium of summer courses for teachers and others held at the university during the months of July and August.

British Columbia.— Secondary education in British Columbia is provided for in superior and high schools. A superior school may be established where there are at least 10 qualified pupils available. The subjects taught are those of the junior and senior fourth classes of the public schools and the first two years of the high schools. The teacher must hold at least a first-class B. C. certificate. A high school may be established in any municipal school district where there are at least 20 qualified pupils available. The teacher must hold a B. C. academic certificate, and the subjects of the course of study are those usually taken up in the high schools of the other provinces. Government assistance to superior and high schools is the same as for other schools, the grant being so much per teacher according to the class of the district, from $360 per teacher in cities of the first class to $480 per teacher in rural municipal districts, with an additional maximum grant of $100. A grant on the same scale is also paid on account of teachers of manual training, domestic science, art and other special subjects, provided such teachers hold B. C. certificates of qualification. Special grants are also made for agricultural education, the greater part, however, being met by a proportion of the special Federal grant. As in the other provinces, the secondary schools are controlled by the Provincial Department of Education and by boards of school trustees, and are visited by provincial inspectors.

The King Edward School, Vancouver, which was established in August 1916, is the only school in the province undertaking a comprehensive technical course. It is intended that at the end of the third year of the course the pupil shall be able to matriculate into the engineering course of the University of British Columbia. Of manual training centres there are 49, with 40 instructors, attended by 992 pupils from the high schools, and of domestic science centres 39, with 29 instructors, attended by 1,406 pupils from the high schools. A commercial course of a thoroughly practical character, covering three years, has been established in the larger high schools. In order to provide for the study of agriculture, the Department of Education proposes to establish classes for both boys and girls in certain high and superior schools. Arrangements have already been made to carry on these classes at three high schools and two superior schools. Extensive courses, suitable to the different localities, have also been provided for young men.

John Seath,
Superintendent of Education, Ontario.

19. HIGHER EDUCATION. The history of higher education in Canada is by no means a homogeneous development in all the provinces. Each province, possessing its own machinery of local government and peculiarities of social and economic condition, has, as might be expected, evolved its own system of higher education. It is, therefore, the more remarkable that the beginnings of university education were almost identical in all the older provinces. This was due to the enlightened policy of the British government, which through the executive heads of the colonies began very early to make provision for future educational needs. In Upper Canada (now Ontario) and New Brunswick this provision took the form of an endowment out of Crown lands for the purposes of higher education. In Nova Scotia, already a self-governing colony, the legislature was encouraged to devote a special grant of money to establish a university and to make an annual appropriation in support of it thereafter, while the Imperial Parliament endorsed this action by voting much more substantial sums both for establishment and for annual maintenance. In Lower Canada (now Quebec) a proposal was made to create an undenominational state university, but the uncompromising hostility of the Roman Catholic Church to the idea prevented it from being carried out. Thus in each of the four colonies or provinces which at the end of the 18th century made up the settled portion of British North America the policy was inaugurated of establishing state universities, either with large land endowments or with the pledge of support by the provincial legislature. The next stage was also alike in all the provinces of older Canada except Lower Canada. In these a narrower view prevailed, and the state college in each, when established, discriminated in favor of the Church of England against other religious denominations. It was an attempt to implant in the colonies the English institution of an established Church, but the conditions in Canada were very different from those in England; the Church of England was numerically hardly stronger than the Presbyterian, Methodist or Baptist bodies separately, and certainly no exclusive right to control the state universities should have been given. The other denominations accordingly, seeing the doors of the state institution closed to their members, or open perhaps but with reservations in favor of a rival Church, established their own institutions of higher education. Thus, instead of a single well-supported university in each province there were several universities of a small calibre, none of them, not excepting the state university, coming up to the standard that had been anticipated when the policy of a single state-supported institution for each province was framed. In course of time the disadvantages of division became more apparent. The denominational character of the state universities was altered and negotiations for alliance were seriously begun. Up to the present time these negotiations have had no result in Nova Scotia or New Brunswick. But in Ontario a third stage has been reached, and the movement to combine resources has met with partial success. In western Canada the history of higher education is different. Profiting, perhaps, by the experience of the older provinces, the state universities in Manitoba and other western provinces have been established under conditions that prevent them from being controlled in the interests of any denomination.

Nova Scotia.— Taking each province in turn, for a more detailed account, we begin with Nova Scotia, the earliest settled of the English-speaking provinces of Canada. The first attempt at establishing a university was made by act of the legislature in 1789 incorporating King's College at Windsor, where a seminary had been founded a year before by legislative aid. A grant of £500 for a site was also made and an annual appropriation of £400 for maintenance. In the following year the British Parliament gave £4,000 in further aid of the infant institution. It does not appear that actual university powers were obtained until 1802, when a royal charter was granted. At the same time an annual subsidy of £1,000, which was not discontinued until 1835, began to be made by the British Parliament. The charter gave control of King's College to the authorities of the Church of England in the province, and at the beginning of its career the governing body unwisely restricted to members of that Church the right of entering the college as students, thus completely establishing the sectarian character of the state institution. A majority of the inhabitants of the province were now debarred from sharing in the benefits to which they had looked forward, and agitation began for a freer system. In response to this demand Dalhousie College was founded at Halifax in 1821 out of funds at the disposal of the governor for provincial purposes. Attempts at fusion of the two state-endowed colleges were subsequently made from time to time but without success. It was as a result of the refusal in 1835 of the governors of King's College to surrender their charter and amalgamate with Dalhousie College that the Imperial grant of £1,000 was withdrawn. Dalhousie College, though founded in 1821 and soon afterward provided with a building, was not opened for academical instruction until 1838, when sufficient funds had accumulated to enable a beginning to be made. In 1841 university powers were conferred by act of legislature and control was vested in a board appointed by the lieutenant-governor. But a similar mistake had been made as in the case of King's College, and Presbyterian influences had been allowed to preside at the organization in 1838. The Baptist body, therefore, seeing one of the state institutions avowedly under Anglican control, the other practically Presbyterian, proceeded to establish a college of its own at Wolfville. It was named Queen's College, and was formally opened in 1839. The act of incorporation conferring university powers was not passed, however, until 1840, and another act in 1841 changed its name to Acadia College, which it still retains, with the alteration of "university" for "college." The Roman Catholic Church, which had always stood apart from any system of higher education under state control, established somewhat later Saint Francis Xavier's College at Antigonish, in the year 1855. Under varying conditions higher education in the province continued to be carried on for a number of years by the institutions named, two of them being the recipients of government bounty. Dalhousie College, indeed, for want of funds was closed from 1845 to 1863, and on reorganization at the latter date was given a strictly non-denominational character. But the hope of uniting all the existing colleges in a single state university has not been given up. In 1876 an act of the legislature established the University of Halifax, which should examine and confer degrees upon candidates sent up by the colleges. The latter, however, gave it no support, and continued to exercise their university functions. In 1881 the legislature withdrew its financial support and at the same time discontinued the annual grant which had hitherto been made to King's College. University federation in Nova Scotia had proved a failure, and no scheme to that effect has since been proposed. A second Roman Catholic college, Collège Sainte Anne, was established in Digby County in 1890; and the Seminary of the Sacred Heart, at Halifax, in 1895.

New Brunswick.— As early as 1786 an endowment of 2,000 acres near Fredericton, the capital, was set aside for the foundation of a provincial Academy of Arts and Sciences, which became incorporated in 1800 as the College of New Brunswick. In 1805 an act was passed authorizing an annual grant of £100 in addition, which was subsequently increased from time to time up to $8,844, at which sum it has stood since 1829. In 1828 the provincial charter was surrendered and a royal charter obtained incorporating the institution under the favorite name of King's College, with university powers. In the following year a suitable building was erected and academical work begun. The royal charter contained, however, the same provision for Church of England control which had already begun to work so disastrously in Nova Scotia, and almost from the moment of its inception the sectarian character of the new college was strongly opposed by other religious denominations. In 1842 the Wesleyan Methodists succeeded in establishing an institution of their own, Mount Allison Academy, at Sackville. At first only a secondary school, it received in 1858 university powers, which came into operation four years later. Meanwhile agitation against the existing constitution of the provincial college began to bear fruit. In 1845 religious tests were abolished, and in 1859 reorganization on a non-denominational basis was effected and the name changed to University of New Brunswick. A third university for the province was added in 1864, when the Roman Catholic College of Saint Joseph was founded at Memramcook.

Quebec.— Before the cession of Canada to Great Britain in 1763 the control of all education in the French colony had been in the hands of the Roman Catholic religious orders. Laval, first bishop of Quebec, had established the Grand Séminaire at Quebec in 1663, which is perpetuated as Laval University of the present day. The Grand Séminaire, however, was not a university, but a theological training college for the priesthood. The first suggestion of a university in the province was made in 1789, when a committee of the executive, in reporting on the condition of education in the province of Lower Canada (now Quebec), recommended the establishment of a non-denominational university at Quebec. The opposition of the Roman Catholic bishop prevented the suggestion from being carried out, and though the hope was long cherished that the project would be renewed under more favorable conditions, no subsequent proposal to that effect was ever formally made. It was left to private enterprise to establish the first university in Lower Canada. In 1813 the Hon. James McGill of Montreal died, leaving by will a piece of land as a site for a university or college and the sum of £10,000 for maintenance. A royal charter was obtained in 1820, but the college, bearing its founder's name, was not opened until 1829, and on the day of its inauguration the Montreal Medical Institute was united to it as its medical faculty. For more than 20 years the college had a precarious existence, its expansion being, to a certain extent, hampered by the constitution of its governing board, but a new charter was obtained in 1852 entirely freeing it from official control. The history of McGill University (q.v.) since that time is a record of steady improvement. It is not identified with any religious body, but there are four affiliated theological colleges — Congregational, Diocesan, Presbyterian and Wesleyan. It owes its present position as one of the leading universities, not only of Canada but of the continent of America, to the generosity of the merchant princes of Montreal, and to the wise and able guidance of Sir J. W. Dawson, principal from 1855 to 1893, and of his successor, Sir William Peterson.

The second university to be established in the province in the interests of the English-speaking inhabitants was in the Church of England institution at Lennoxville, called Bishop's College. It was incorporated in 1843, but a royal charter conferring university powers was not obtained until 1853. In the previous year, 1852, a royal charter had also issued to the corporation of the Grand Séminaire of Quebec empowering it to confer degrees and exercise other university functions, under the name of Université Laval. The university thus established remains the sole Roman Catholic university of the province, with faculties of divinity, law, medicine and arts, having affiliated colleges and seminaries in various towns, and an integral branch of itself at Montreal under the name of «Succursale de l'Université Laval.» Saint Mary's College at Montreal, under control of the Jesuit order, incorporated in 1852, has since 1889 been entitled by papal brief to confer degrees of Laval University. There are numerous Roman Catholic colleges affiliated to Laval University, some of them of considerable antiquity. The oldest are Saint Raphael's College at Montreal, established by the Sulpicians in 1773; those at Nicolet, founded in 1804; Sainte Hyacinthe, in 1812; Sainte Thérèse in 1824; Sainte Anne de la Pocatière, in 1827; and L'Assumption, in 1832. The higher education given at these colleges is chiefly theological. JAMES LOUDON.

Ontario.— The history of higher education in Ontario shows a somewhat different development from that in the older provinces. In 1798 the legislature set aside an endowment of 500,000 acres of Crown lands for the purposes of higher education, but nothing further was done at that time to carry the project into effect. In 1827, however, a royal charter was granted for the establishment of a university under the name of King's College. By the terms of the charter, the institution was to be under the control of the Church of England. It was natural that the other religious bodies should enter a vigorous protest against these terms, and when this proved unavailing, should take steps to establish independent colleges. Consequently in 1830 the Methodist Church of Canada resolved to found an institution of higher learning in Upper Canada. That this resolve was not due to narrow sectarian prejudices is vouched for by the fact that religious tests were not to be required for admission, and, further, that a distinct stipulation was made with the early subscribers that «this shall be purely a literary institution» and that «no system of divinity shall be taught therein.» In 1836 the college was established in Cobourg under the name of Upper Canada Academy. It was incorporated by letters patent on 12 Oct. 1836 — the first royal charter granted to any Nonconformist institution of learning in the British dominions. In 1841 the first Parliament of Canada extended the charter and changed the name to Victoria College, with power to grant degrees in the various faculties. Work in the faculty of arts was begun in the same year. This was therefore the first university in actual operation in the province. The Presbyterian Church, which some years previously had petitioned the provincial government «to endow without delay, an institution or professorships for the education and training of young men for the ministry in connection with the Synod» had received but little encouragement, and so steps were taken to found a college somewhat after the model of the Scottish national universities. A royal charter was granted on 16 Oct. 1841 for the establishment of Queen's College at Kingston, and the first classes were opened there in March of the following year.

In the meanwhile affairs at King's College had been almost at a standstill. Owing to the pressure of public opinion a modification of the charter had been made by the legislature in 1837, but the chief grievances had not been removed. Teaching was not actually begun until 1843, that is, not until after the two other colleges had been established. The agitation increased in volume and bitterness until in 1849 it effected a complete change in the constitution of the university. The special privileges accorded to members of the Church of England were abolished. From this time on the University of Toronto, as it was now called, was non-sectarian. The immediate effect of this reorganization seemed at first disastrous. Within three years a charter had been granted to a new university in Toronto entirely under Anglican control. Trinity College began work early in 1852, and the university constituency was still further divided. In 1866 three more denominational colleges were opened in Ontario, namely, Ottawa College (Roman Catholic), which in this year was granted the power of conferring university degrees, and in 1889 became the University of Ottawa; Regiopolis College (Roman Catholic), at Kingston; and Albert College (Methodist Episcopal), at Belleville. In 1878 Huron College (Anglican) at London became Western University, and in 1887 Toronto Baptist College and Woodstock College were united under the corporate name of McMaster University with full university powers. Not all of these have survived, however. Regiopolis College closed its doors in 1869; and in 1884, in consequence of the union of the various branches of Methodism in Canada, Albert College was incorporated in so far as its undergraduate work was concerned with Victoria College, and the name of the latter was changed to Victoria University.

The evils of the multiplication of small colleges brought about their own cure. The enormous expansion of modern science imperatively demanded large expenditures for both buildings and equipment, and none of the existing institutions was able adequately to meet the demand. It was natural therefore that an effort should be made to devise a plan by which the ruinous duplication of expensive apparatus and plant could be avoided. Accordingly in 1884 the Minister of Education called a meeting of the heads of the various colleges and universities of the province for the purpose of discussing ways and means to accomplish this end. The result of these deliberations was that an act was passed by the legislature in 1887 reorganizing the university in order to permit of the federation of the various institutions involved. Queen's University, which at one time had seemed ready to accept the federation idea, finally decided to retain its independence at Kingston. The only Arts colleges, therefore, to carry out the scheme were Toronto and Victoria. The latter agreed to hold in abeyance its degree conferring power in all departments except Divinity, and in 1891 moved from Cobourg to Toronto. In 1903 Trinity College entered into federation and in 1907 Saint Michael's College (Roman Catholic) also began work as an Arts college of the University of Toronto.

The first 14 years of the 20th century were years of extraordinary expansion for Canadian universities. Queen's University had now a clear field in eastern Ontario and under the late Principal Grant became one of the great universities of the Dominion. The University of Toronto under the late President Loudon, and since 1907 under President R. A. (now Sir Robert) Falconer grew to be one of the largest universities in the British Empire. At the outbreak of the war, which swept it almost clean of men students, as it did most British universities, the enrolment stood at 4,428.

Western Provinces.— Higher education in Manitoba is of recent date. By act of legislature in 1877 the University of Manitoba was established, with the sole power of conferring degrees in arts, law and medicine in the province; degrees in divinity may only be conferred by colleges affiliated with the university. In its early years the university was an examining and degree-conferring body only, all teaching being left to the affiliated colleges. Later, however, a grant of land was made by the provincial government for the erection of a building for purposes of instruction in the departments of science and for a university library.

There are seven colleges affiliated with the University of Manitoba: Saint Boniface College is a Roman Catholic institution and was established as a small school so early as 1818; Saint John's College (Church of England) was founded in 1866; Manitoba College (Presbyterian) in 1871; Wesley College (Methodist) in 1888; Manitoba Medical College was affiliated in 1882; the College of Pharmacy in 1902; and the Agricultural College in 1907. All are in Winnipeg except Saint Boniface College, which remains at the town of Saint Boniface, where it was first established. The growth of the institution necessitated new buildings and a site was chosen at Tuxedo Park and buildings erected.

In 1903 an ordinance was passed to establish a university for the Northwest territories, which has developed into the University of Saskatchewan. The corner-stone of the first building was laid by Sir Wilfrid Laurier at Saskatoon in 1910 and the building opened for students in 1912. Emmanuel College, founded in 1879 at Prince Albert by Bishop McLean for the training of native helpers, and transferred in 1909 to Saskatoon, was the first of the affiliated colleges. A place of special prominence is given to agriculture at this university. A university for Alberta was founded at Edmonton and the first session opened in 1908. Since then permanent buildings have been erected, and various theological colleges and professional societies affiliated to the university. From 1899 to the opening at Vancouver in September 1915 of the University of British Columbia, the interests of higher education in that province were served by the McGill University College of British Columbia, an institution which had two branches, one at Vancouver and the other at Victoria, and both affiliated to the McGill University at Montreal.

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20. PUBLIC EDUCATION. Under the provisions of the British North America Act, control of public education in Canada is vested in the provincial governments. The position of dissentient denominational schools is, it is true, specially safeguarded under the Act (30–31 Vict., c. 3, par. 93), and on their behalf the Dominion Parliament may interpose remedial legislation, but, with this exception, the whole organization, conduct and maintenance of education lies with the provinces. At the time of confederation the provinces then existing had already in operation a system of free elementary schools, which has since been expanded into the present efficient organization. In general there are two fundamental systems of education throughout Canada, one that of the Protestant communities, free from the control of religious bodies, and the other that of the Roman Catholic French and Irish communities in which education is united with the religious teaching of the Roman Catholic Church. In Ontario, Roman Catholics have the right to form what are known as «Separate Schools» for elementary education, the local rates for the support of these schools being separately levied and applied. In Quebec, Saskatchewan and Alberta similar provisions apply. In the remaining provinces there are no separate schools for Roman Catholics with state support. The figures of the census of 1911 show the high standard obtained in public education in Canada. In a population of 6,319,160 persons over five years old, only 11.02 per cent are illiterate; in the province of Ontario of the persons over five years old, the illiterates number 8 per cent. The percentage of illiteracy is highest amongst the foreign-born and lowest amongst the British-born population. The latest reports available in 1917 show 1,250,000 pupils in 24,871 primary and secondary schools of Canada with about 36,000 teachers. Except in the province of Quebec all but a small fraction of these schools are government institutions. Throughout the Dominion the cost of education is defrayed from the public revenues, provincial and local, and public elementary education is free, except for certain small fees which are payable in parts of the province of Quebec. With the exception of Quebec all the provinces have laws of compulsory education, but under conditions that differ between one province and another. The schools are co-educational and are controlled (within the scope of provincial statutes and regulations) by locally elected trustees. Secondary schools or departments and colleges or universities for higher education, exist under government control in all the provinces, and the three classes of teaching institutions are more or less coordinated to allow of natural transition from the lower to the higher. Recent movements in the direction of nature study, manual instruction, school gardens, agriculture, domestic science and technical education are all energetically in progress.

For the organization of education it is necessary to consider the provinces separately. Ontario, the most populous of the provinces and the most advanced in matters of education, having largely influenced the educational systems of the other Protestant parts of Canada, deserves the most detailed treatment. The system of public education in Ontario includes kindergartens, public (primary) schools, continuation schools, high schools and collegiate institutes, and a provincial university, the whole forming an organic unit. There are, in addition, night schools, art schools, model schools, normal schools, teachers' institutes, libraries and technical and industrial schools. Kindergarten schools, admitting children between the ages of four and seven, may be organized at the option of boards of school trustees in cities, towns and incorporated villages. There are at present 216 such schools in the cities and towns of Ontario, with an enrolment of 25,554 pupils. The exercises consist of singing, marching, sewing, object lessons, etc. Above these are the public schools of the province, whose organization (first placed on a comprehensive basis in 1844 by Egerton Ryerson, superintendent of education), owes much to the education system of the State of New York. Every township is divided by its council into school sections, and for each section, each incorporated village, town and city there is a board of trustees. The latter are elected by the ratepayers, both male and female. Within the provisions of the statutes of the province, and the regulations of the education department, the trustees appoint the teachers, determine the salaries and provide and maintain buildings and equipment. The provincial government makes an annual grant of money to each school according to the average number of pupils in attendance. For the rural schools the county council adds an equal grant, the township council contributes $100 ($150 for a school with two teachers), and the remaining funds needed are raised from the ratepayers. In cities, towns and villages the legislative grant is supplemented by funds raised by the municipal council. All the public schools are free, and under an Act of 1891, trustees are empowered to supply textbooks either free or at reduced prices. In the uniform course of study prescribed by the education department, chief stress is laid on reading, writing, arithmetic, grammar, geography and drawing. In the upper forms British and Canadian history and commercial subjects are taught; agriculture is taught in rural schools. Periodic talks are given on temperance and hygiene. Only textbooks authorized by the education department are allowed. Attendance is obligatory for all children between the ages of 8 and 14 years, not attending separate schools and not under efficient instruction at home. The public schools are strictly nonsectarian, but the schools are opened and closed with the reading of the Lord's prayer and portions of the Scriptures are read daily. The clergy of any denomination may arrange with the trustees to give religious instruction in the school after the regular hours. Any group of five or more heads of families may, upon giving notice to the municipal clerk, cease to pay school rates, and become supporters of a separate school. This privilege may be used by any religious sect or by persons of color; in actual fact, of the 542 separate schools existing in Ontario all but five are Roman Catholic institutions. The course of instruction given in the separate schools is almost indentical with that of the public schools, with the addition of special religious teaching. Separate schools share in the legislative grant. In 1916 there were 6,600 public schools (including 537 Roman Catholic separate schools) with 11,850 teachers (including 1,389 in Roman Catholic separate schools) and 505,074 pupils, 67,481 of whom attend the Roman Catholic separate schools. The average salaries in public schools are as follows: Province — male $902, female $613; urban — male $1,310, female $696; rural — male $621, female $549. For secondary education Ontario has an admirable system of high schools and collegiate institutes; these are almost identical in character, the collegiate having a larger and more highly qualified staff, special facilities in regard to apparatus, etc., and receiving a larger government grant. Any high school may become a collegiate institute on fulfilling the requirements. High schools and collegiate institutes are created by municipal and county councils and managed by elective boards of trustees. The original cost, and the cost of permanent improvements are defrayed by the local authorities. For current expenditure, the provincial government contributes a yearly grant varying according to situation, attendance, etc., but with a fixed minimum. The grants average from $500 to $800. The county contributes an equal amount. The remaining expense is met by the municipality. About one-third of the schools are free, in the others the annual fee varies from $2.50 to $26. A uniform examination is prescribed for admission. A graded series of four forms leads to the uniform "leaving" examinations (junior and senior) conducted by the department, on the results of which certificates are granted. The matriculation examination for the provincial university is almost identical with the junior leaving examination. In 1916 there were in Ontario, 160 high schools and collegiate institutes, with 1,023 teachers and 38,426 pupils. Co-education obtains in all of them, approximately 20,000 of the registered pupils being girls. The total expenditure was $3,444,940. One hundred and thirty-two continuation schools intended to provide an education suited to the needs of the youth of the agricultural communities have been established. The number of pupils in 1916 was 6,800 with 237 teachers. The total expenditure was $294,125. The total school expenditure for all classes of schools was $17,049,244, the provincial government grant amounting to $1,104,775. Special attention is paid in Ontario to the uniform qualification and training of teachers. The lowest grade of public school teachers (third class) must pass the high school primary examination (Forms I and II) and attend a county model school. Teachers of the second class must pass the junior leaving and attend the provincial normal school. Teachers of the first class must pass the senior leaving examination, and attend the school of pedagogy in Toronto. To hold a position in a high school a teacher must hold a first class public school certificate, or have passed at least equivalent university examinations. For special positions in collegiates, higher university standing is demanded, varying according to the subject. Unless by special permission of the department, only the certificates of the universities in Ontario are accepted. At the head of the system is the Minister of Education, a member of the Provincial Cabinet.

The problem of public education in the Province of Quebec, owing to the division of the population between the French and English races, and the Roman Catholic and Protestant religions is one of peculiar difficulty. The difference of creeds has led to the establishment of a dual system of elementary, secondary and superior schools. The Roman Catholics of the province, numbering (census of 1911) 1,724,683, had 6,119 schools of all kinds; the Protestant population of 378,549 had 897. At the head of the educational system is a superintendent of public instruction with a council composed of all the Roman Catholic bishops whose dioceses or parts of whose dioceses are in the Provinces of Quebec, now numbering 15, an equal number of Roman Catholic laymen appointed by the Crown and an equal number of Protestants similarly appointed. Within the council are a Protestant committee and a Roman Catholic committee which control the schools of their respective denominations. Each has its elementary, model, normal and high schools and academies. School attendance is not compulsory. In each parish or township there is a board of school commissioners elected by the owners of real estate. These erect and maintain schools, appoint teachers and levy the school tax, which falls on real property only. But in any such district a dissentient minority professing a religious faith different from that of the majority, may organize themselves separately, elect a board of trustees and conduct a school of their own. In the cities and towns there are separate Protestant and Roman Catholic boards of school commissioners. Real estate is taxed for school purposes according to the religious faith of its owners. The financial resources of the school municipalities comprise (1) the sums raised by local rates, and (2) grants made by the Legislature. The former consists of the school assessment, which is levied on all ratable property of a school municipality and the monthly fee, which is collected for every child who attends or who should attend the public schools. The grant of the Legislature is divided proportionately to the number of the children enrolled. In 1916 there were 5,998 elementary schools, with 7,982 teachers and 251,492 pupils. The average salary for elementary teachers is male $938 and female $236. There were 1,042 academies, high schools and model schools, with 196,595 pupils. The public schools mentioned above are practically Roman Catholic schools with 897 separate schools attended by 54,745 pupils, of whom nearly all are Protestants. The total school expenditure for the province in 1916 was $11,564,043.64, the government grant amounting to $1,882,837.73.

In each of the three maritime provinces (New Brunswick, Nova Scotia and Prince Edward Island) there is a system of public elementary schools, normal schools, high schools and academies (grammar schools in New Brunswick), whose organization closely resembles that of the Ontario schools. In each province the executive council, acting through its superintendent of education is at the head of the system. The elementary schools are free, co-educational, non-denominational, with compulsory attendance, placed under trustees elected in each school district, and supported partly by provincial, county and municipal grants, partly by local assessments. In these provinces the annual "school meeting" of ratepayers which elects the trustees, also votes the amount of money to be locally assessed. In Prince Edward Island in 1916 there were 476 public schools with 595 teachers and 18,362 pupils. The average salary for primary school teachers is male $276–$543 and female $220–$371. There were 28 first class schools (doing high school work) with 1,563 pupils. The total school expenditure for the year was $244,572.29, the provincial expenditure amounting to $173,962.56. In Prince Edward Island the Prince of Wales College at Charlottetown is a secondary school with governmental support, having a normal school department for the training of teachers. In New Brunswick in 1916 there were 2,020 public schools with 2,141 teachers and 66,044 pupils. The average salary for public school teachers is: Male $290–$873, female $261–$482. There were 39 grammar and superior schools (high school grades) with 2,365 pupils. The total school expenditure for the year was $1,221,224.71, the government grant amounting to $280,827.35. In certain towns and in some French Canadian settlements there are separate schools for Roman Catholics, attendance at which satisfies the requirements of the provincial law, but the schools are neither supported nor controlled by the state. New Brunswick has a provincial university, whose president is adjoined to the executive council in its capacity of board of education. In Nova Scotia in 1916 there were 2,837 public schools with 3,019 teachers and 99,463 pupils. The average salary for public school teachers is: Male $262–$872 and female $238–$482. There were 64 high schools (including 18 academies) with 9,726 pupils. The total school expenditure for the year was $1,620,154, the provincial government grant amounting to $414,738.

In Manitoba the executive council, or cabinet, is at the head of public education. There is a minister of education who is advised and assisted by a deputy minister and a superintendent. An advisory board, partly appointed, partly elected by the teachers, aids the government in organizing the school curriculum, establishing teachers' qualifications, etc. The provincial system includes public (primary) schools, a higher grade of which are called intermediate schools, and secondary education is provided for in high schools and collegiate institutes. Schools are free and are supported by provincial grants, municipal grants and a local school tax levied by the trustees. School districts are erected by local municipalities and trustees are elected therein. The whole system closely resembles that of Ontario. (For the provincial university see article CANADIAN UNIVERSITIES). The question of separate schools for Roman Catholics was long a subject of acute controversy. Established in 1871, they were abolished in 1890. The agitation in favor of their restoration reached an alarming crisis in 1895. A compromise was made in 1896 whereby religious instruction may be given during the last half hour of the school day, and which permits the Roman Catholic school children of a district, if numbering 25 or more, to have a teacher of their own denomination. Manitoba has two provincial normal schools for the training of teachers, one in Winnipeg and the other in Brandon. In 1916 there were 1900 public schools with 2,991 teachers and 97,100 pupils. The average salary for a public school teacher is $768. There were 102 high schools and collegiate institutes with 6,696 pupils. The total school expenditure for the year was $6,658,229, the provincial government grant amounting to $901,117.40.

British Columbia has a system of free, nondenominational public schools, controlled by the provincial government through a superintendent of education. The schools are supported partly from the provincial treasury and partly by the sums raised by the district assessment. In British Columbia in 1916 there were 808 public schools, with 1,984 teachers and 64,570 pupils. The average salary for public school teachers is $800. There were 40 high schools, controlled by local boards of trustees, with 4,770 pupils. The total school expenditure was $3,216,350, the provincial government grant amounting to $1,591,322. British Columbia has two normal schools and a provincial university.

The provinces of Alberta and Saskatchewan have systems of public schools administered by a Department of Education presided over by a minister of education, who is assisted in the case of Saskatchewan by a superintendent of education, and in Alberta by a deputy minister as permanent administrative head. The organization is similar to that of Ontario. In the provinces of Alberta and Saskatchewan the minority ratepayers in any district, whether Roman Catholic or Protestant, may establish separate schools and become liable only to assessment at such rates as they impose upon themselves in respect thereof. In practice this privilege is but little used. In 1917 there were in Saskatchewan only 19 separate schools out of a total of 4,022 elementary schools, and in Alberta only nine separate schools. There are normal schools at Regina, Saskatoon, Edmonton and Calgary, and universities at Regina, Saskatchewan and Strathcona, Alberta.

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21. TECHNICAL EDUCATION IN CANADA. The term technical education is used with a variety of meanings. The general idea seems to be the use of schools and industrial appliances in preparing young men and women for skilled occupations. "Even in Germany," we are told, "the old apprenticeship is dead." However even the narrower statement seems to be becoming still more limited, for the legal and clerical professions, which seem still to require education and apprenticeship, and even the medical profession, which demands a time course and fixed laboratory work, are not now regarded in the public mind as coming under the heading of technical education. Technical education, in its present more limited use, seems to be regarded as a joint course of proportionate time in the class room and another period of time in the practice of handicraft — sometimes spoken of as a "trade" or "industry." Whether this definition be generally accepted or not, we shall follow it in this article.

In Canada the most notable event in connection with this specific education is found in the appointment in 1910 of the "Royal Commission on Industrial Training and Technical Education." As one of the commissioners on this body the writer may state that it was constituted as a court with seven members from different parts of Canada with a skilled secretary. This body, under the direction of the Dominion government, spent two years or more in (1) taking sworn evidence in Canada from 1,400 witnesses of every class (including in the evenings representatives of the "labor organizations") as to their industrial needs. (2) Visiting manufactories, schools and universities in Canada. (3) Going, under government direction, to other countries, including the United States, and in Europe, the British Isles, France, Germany, Switzerland, Holland, Belgium and Denmark. (4) Embodying their report in four large octavo volumes aggregating in all nearly 2,000 pages. In their report the Royal Commission gave an elaborate sketch of what they had seen in all these lands and made a recommendation that $3,000,000 a year for 10 years, making a total of $30,000,000, should be appropriated for securing "industrial training and technical education" for as many as sought it among the Canadian people.

In the Canadian Confederation the matter of education is reserved to the nine provinces of the Dominion, viz., Nova Scotia, New Brunswick, Prince Edward Island, Quebec, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia. To meet this case, the proposal of the Royal Commission is that while the Dominion will give the money to be supplied and administered by a "Dominion Government Commission" appointed by itself, yet it is to be given through the medium of boards and committees under the authority of the several provinces. The suggestion has been cordially received by the various provincial governments, and but for the European War, in which Canada as a part of the British empire is involved, would have been almost certainly carried out.

The Objects of the Royal Commission.— These are: (1) The education of trained teachers and demonstrators to carry out the purposes of the commission. (2) The establishment of classes, courses and schools for industrial training and technical education. (3) Provision to be made for laboratory apparatus and teaching equipment. (4) Scholarships to be given to deserving pupils. (5) Provision for traveling experts to visit institutions. (6) Help for institutions, such as universities and colleges. (7) Promotion of diffusion of scientific and industrial research.

CANADA'S PRESENT EQUIPMENT.

I. **Under University Control.**— Commencing with the Atlantic coast, the Halifax Technical College is affiliated with several of the universities of Nova Scotia and New Brunswick. It has a competent staff of professors and assistants. Engineering students who take two years in the universities in a suitable course enter in their third year and finish in their fourth in the technical college. This arrangement has proved very successful. An excellent engineering department is found in McGill University, Montreal. This department receives efficient support from the Canadian Pacific Railway. Queen's University, Kingston, Ontario, especially in its mining school, has excellent courses in practical science. Toronto University — the provincial university — has a strong faculty of applied science. The several departments of the faculty distributed in various buildings are: Civil engineering, mining engineering, mechanical engineering, architecture, analytical and applied chemistry, chemical engineering and electrical engineering.

II. **Government and Municipal Technical Schools.**— The several provinces of the Dominion have their different methods of dealing with technical education, and the newer provinces are much alive to the necessity of such schools. Nova Scotia, though not a large province, has been forward in providing various kinds of science schools. Much attention has been paid to continuation and night schools. The coal mining schools have been efficiently used in this province. Other mining schools also are maintained. Technical schools are maintained in Truro, Amherst, Yarmouth, New Glascow and Sidney. The province of Quebec has two notable technical schools maintained by the provincial government, besides a number of smaller local schools of this type. (1) *Montreal.*— This technical school, opened in 1911, is declared to rival any technical school of its class in America or Europe. It was erected and is maintained by the Quebec provincial government. The city of Montreal also assists it. Day and night classes of every variety are maintained. (2) *Quebec City.*— A replica of the Montreal school, erected and supported by the government of the province, is three-fifths of the size of the Montreal school. (3) The Shawinigan Technical Institute, on the Saint Maurice River, is a remarkably complete school, maintained in part by the Quebec government in a thriving manufacturing town. In the province of Ontario, in 1915, a magnificent technical school was erected in Toronto, at a cost of $1,400,000 exclusive of site and equipment, to take the place of one limited in size and efficiency. The new school (with seven acres of floor space) can accommodate 2,500 day pupils and a vast number of night pupils, giving instruction in a great variety of subjects. It represents the aspiration of Toronto to be a great manufacturing centre. (4) Hamilton City, also aiming at being a leading trade city, in 1909 erected a building, costing $100,000, exclusively for technical education. Here, adjacent to a regular collegiate school efficient teaching is given in wood-working, machinery, forging, electrical work, household science, drafting, printing and in fine arts. Brantford, called the «Sheffield» of Canada, has lately finished a commodious technical school. Woodstock, Kitchener (late Berlin), Peterborough and Saint Thomas are industrial centres with excellent educational facilities. In most of these schools wood-working, building construction, mathematics, mechanical drawing, applied sciences, dressmaking, millinery, commercial work and practical English are largely taught. Many other Ontario towns have technical evening schools. In the mineral region of Ontario on Lake Huron are two towns — Sault Sainte Marie and Sudbury, in which apprentices and workmen receive training in their craft.

In Winnipeg, Manitoba, now the third city in size of the Dominion, two great technical high schools — called respectively the Kelvin and the Saint John's — erected by the city itself at a cost of $450,000 each without site, are in full operation, and of the night schools of the city numbering 5,000 in attendance half are in these technical schools. Calgary, a considerable city of Alberta, has shown great enterprise in this direction and has large and very successful schools in many technical subjects.

On the Pacific Coast the city of Vancouver, British Columbia, has gained a high reputation, especially for its technical night schools.

III. **Railway Employee Schools.**— In Stratford (Grand Trunk shops), in Saint Thomas (New York Central shops), in Montreal (Canadian Pacific shops). A successful training is given to young lads who enter the shops about the age of 13 to 15. The hours in the morning are taken from the company's time, and the teaching is done in the shop precincts. Shop mechanics, workshop practice, mechanical drawing — also mechanics, electricity, car construction, and, if desired, telegraphy and shorthand are taught.

IV. **Agriculture and Horticulture.**— The cry of the agriculturist preceded that of the manufacturer and the first ambitious design of Canadians was to improve agriculture. Hence the provincial demand in almost every case is for technology on the farm. After several weak attempts in Nova Scotia at agricultural teaching the college at Truro was begun there in 1905. It has been a popular institution and draws its pupils from the three maritime provinces of Nova Scotia, New Brunswick and Prince Edward Island. The summer school of science, which has existed in Nova Scotia for some 30 years, has been merged into the Agricultural College at Truro, which for the last 10 years (1908–18) has been well maintained in this town. From 200 to 500 teachers of public schools attend the six weeks' course in training supplied by the Agricultural College at Truro. The province meets the expense of traveling and maintenance for the session and is doing a large work for the maritime provinces of Canada. Two excellent agricultural colleges are found in the province of Quebec, viz., the Macdonald College at Saint Anne and the Oka College in the Ottawa River District. The former of these is 20 miles from Montreal and its farms and beautiful buildings are the gift of Sir William Macdonald, a wealthy manufacturer of Montreal. It is divided into three parts: a school of agriculture, a school for teachers and a school for household science. Registration, tuition, board and laboratory fees are charged. Various courses are given in horticulture, farming, etc., making the institution a boon to the province and attracting considerable numbers from other provinces. Chiefly for the benefit of the element of French-speaking people in Quebec, who are largely farmers, the Oka College was, after some 14 years of more or less successful existence, reorganized in 1909. It is affiliated with the French University (Laval) in Quebec. It is well housed and has a farm of 1,800 acres, 700 under cultivation. Its laboratories are well equipped and it has a good technical laboratory. Both the French and English languages are taught in the college. Forestry is taught and Quebec has the most complete fire protection of its forests of any province of the Dominion. The college announcement says: «Agricultural tastes and agricultural education produce a virile nation!» The examinations are conducted by the authorities of Laval University. In Ontario, the Provincial Agricultural College of the province is situated near the city of Guelph. It is one of the most notable agricultural colleges on the American continent. It has a staff of 46 instructors, and lately a branch for women was opened. In 1909 there were 1,296 students in attendance. It gives courses for rural teachers. The college course that leads to a degree at Toronto University is four years. There are over 5,000 members of the Farmer's Union who are conducting agricultural experiments and reporting each year to the college authorities. This college has been the alma mater or educator of professors in agriculture in the other provinces of the Dominion, and also in many of the agricultural colleges in the United States. The Agricultural College of the province of Manitoba, with its 8 or 10 buildings, is the most magnificent of the agricultural colleges of the Dominion, costing some $4,000,000. It is affiliated with the University of Manitoba, Winnipeg, and has a complete staff. It has educated bands of students and conducts extensive courses, lectures, etc., throughout the province. It aims at reaching large numbers of the people by holding summer schools, uniting several professions and devoting itself heartily to prairie life. The Saskatchewan Agricultural College is a part of the University of Saskatchewan, which is located at the city of Saskatoon. Its extensive work has been very widespread. The faculty proposes to develop along lines of investigation, teaching and extension work. Its extension work has taken the following forms: Encouraging agricultural societies and competition in stock and farming, farmers' institutes, excursions to experimental farms and seed-grain farms, institutes, farmers' and women's clubs. The government gives a liberal appropriation for this work. Alberta and British Columbia are newly established universities and both have agricultural farms maintained by the Dominion. No doubt they will develop largely along the line of those of the provinces of Manitoba and Saskatchewan. The Conservation Commission of Canada, with its headquarters at Ottawa, has done in its seven years of service in agricultural problems, health, town-planning and forest protection, protection of game and fish, notable work in technical research.

V. Special Features.— In different provinces are found special features: (a) Mining schools with 673 pupils in attendance are found in 29 places in Nova Scotia; (b) in connection with Saskatchewan agricultural department of the University at Saskatoon extension work takes place for experimental farms, farmers' institutes, agricultural societies, farmers' and women's clubs, etc. This is a peripatetic experiment. In 1916 the Dominion government urged on by learned societies established an Honorary Advisory Council of Scientific and Industrial Research in Canada. This council was closely attached to leading departments of the Dominion government at Ottawa. Several scientists of world-wide reputation, such as Dr. Macallum, Dr. F. D. Adams, Dr. J. C. McLennan and Dr. A. S. Mackenzie were placed on it. Leaders in trade, agriculture, labor and research were chosen to deal with natural resources, waste products, forestry, farming and pressing industrial problems. This movement has been viewed in Canada with universal approbation.

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Member of Conservation Commission of Canada; Royal Commission on Technical Education (1910–13), *and of Royal Society Committee on Research* (1916).

22. CATHOLIC EDUCATION. The French Regime (1608–1760).— During this period education in Canada was almost entirely under the control of the Catholic Church. The first permanent school was the «Little School» founded by the Jesuits at Quebec in 1635. The first institution of higher learning was the Jesuits' College, also at Quebec, opened in 1636 or 1637. It maintained a classical course similar to those of the famous Jesuit colleges of France, and, after 1707, when the public School of Hydrography was attached to it, became a scientific centre of some importance. In 1663 Bishop Laval founded the Seminary of Quebec; in 1668 the Little Seminary, a preparatory school for boys aspiring to the priesthood; and about the same date the model farm and industrial school of Saint Joachim at Cap Tourmente. From 1666 schools for boys were maintained in Montreal by the Sulpician Fathers, and in several smaller towns and villages schools were established by the Récollets. From 1718 to 1730 the Hospitaller Brothers of Montreal, assisted by a royal grant, maintained a kind of normal school, and supported eight teachers in Montreal and neighboring parishes. Convent schools for girls were conducted by the Ursulines at Quebec (1639) and Three Rivers (1697), and by the Congregation of Notre Dame, founded at Montreal in 1659 by Marguerite Bourgeoys and represented by branches in many of the larger villages. Moreover, by the middle of the 18th century parochial schools existed in the majority of the country parishes. After 1727 teachers were by ordinance placed under the supervision of the parish priests, and were required to obtain licenses both from the King's Intendant and from the Bishop or Archdeacon of Quebec. Some country schools had Latin classes. In general, education was more widespread than might be assumed. A majority, or at least a very large minority, of the *habitants* could read and write. All this was accomplished by the free efforts of Church and people; no assistance was obtained from government, except a few slight subsidies and some grants of land to religious teaching orders. In Acadia (now Nova Scotia and New Brunswick) education was more backward than in Canada. We hear of a seminary and a girls' school at Port Royal (now Annapolis) before 1640, and, after the temporary English conquest of 1654, of schools for boys and girls. These disappeared on the final conquest in 1710. In Cape Breton the fortress-town of Louisbourg had its own schools, including a convent of the Sisters of Notre Dame, but town and schools alike disappeared after the capitulation to the English in 1758.

Canada 1760–1867.— The British conquest was followed by a decline in education. The Church in Canada was thrown on its own resources by the break with France, and hampered by the prejudices of alien rulers. The British government tolerated the religious orders of women, but directed the gradual extinction of those of men and the confiscation of their property, property which Canadians believed to have been granted, in large part, as an endowment for education. The Jesuits' College was abandoned in 1768. Both Jesuits and Récollets disappeared at the beginning of the 19th century, but Sulpician exiles from Revolutionary France were admitted to Canada, and henceforth that order revived. The government had ordered measures to be taken — especially the establishment of Protestant schools — to win the Canadians to Protestantism, but in fact little attempt at proselytism was made. Nevertheless the suspicions of the inhabitants were aroused, and there was made permanent under British rule that close union of religion and national culture which is so marked a characteristic of the French Canadian people. In 1791 the colony was divided into the provinces of Lower Canada, mainly French and Catholic, and Upper Canada, where the inhabitants were chiefly newly-arrived English-speaking Protestants. Parliamentary institutions were conceded, and through these the Catholic people of Lower Canada gradually obtained control of their schools. An attempt in 1818 to give a monopoly of education to the Royal Institution for the Advancement of Learning, a body mainly English and Anglican, was defeated by the hostility of the people themselves. In 1824 the independent religious schools, Catholic and Protestant, were recognized by the Legislature, and in 1829 they received state aid. After 1829 the revenues from the Jesuit estates were devoted to educational purposes, and in 1839 the Sulpician estates were confirmed to that order. In Upper Canada Catholics were not numerous. Only a few schools were established, several by the Rev. Alexander Macdonell (consecrated Bishop of Kingston in 1826), who brought teachers from Scotland and obtained a small subsidy from the British government. In 1840 the two Canadian provinces were reunited. Contrary to expectations, this strengthened the position of the French, and, because of their support, of the Catholics of Upper Canada. The period which followed was one of conflict between the ideal of educational uniformity — the imposition on all classes of a uniform system, more or less secular in character — and that of freedom — the preservation to each locality, and especially to each religious denomination, of a large liberty in shaping the teaching of its children. The Act of 1841 organizing primary schools allowed the religious minority in any locality to establish a separate school and receive its due proportion of state aid. Thence sprang the Separate Schools of Upper Canada and the Protestant Schools of Lower Canada. The independent denominational school system was fully established in the lower province by 1846, but in Upper Canada a bitter struggle preceded the complete recognition of Separate Schools, which was accomplished by the Scott Act of 1863. The latter part of this epoch was marked by the founding in Canada, or the introduction from abroad, of a large number of religious teaching orders, and also by the opening of many of those classical and commercial colleges which play so large a rôle in education in Quebec. In 1852 the Seminary of Quebec founded Laval University, and in 1866 in Upper Canada Regiopolis College (founded at Kingston, 1846) and Ottawa College (founded as the College of Bytown, 1849) received charters as universities.

The Maritime Provinces, 1760–1867.— After the British conquest only a few Catholics — Indians, refugee Acadians and Irish settlers — remained in these regions. From 1766 to 1786 all teaching by "popish recusants" was sternly prohibited by law, and even after that date Catholic schools were few and irregular. The repatriation of the Acadians, and Irish and especially Scottish immigration, gradually improved the Catholic position. In 1802 Father Edmund Burke, afterwards bishop, built a college at Halifax but could not find teachers. In 1820 he had two flourishing schools in that city, and the beginning of a seminary. As time passed other institutions of higher learning were opened, religious teachers brought in, and Catholic primary schools established, receiving in some places state aid.

The West 1760–1870.— In 1818 Father — afterward Bishop — Provencher established a mission on the Red River and opened schools at Saint Boniface and Pembina. He and his successor, Bishop Taché, labored earnestly in the cause of education. At Saint Boniface Latin classes were begun about 1823, a girls' school was established in 1829, and an industrial school in 1838. By 1845 five Catholic schools were in permanent operation in the West, besides several of irregular character. Father Lacombe opened a school at Edmonton in 1862, and about the same time the foundations of Catholic education were being laid in British Columbia, where colleges were opened at Victoria, 1863, and at New Westminster, 1866. The College of Saint Boniface had been established in 1857. In 1845 the Grey Nuns came to Saint Boniface, and in 1859 the Sisters of Saint Anne to Victoria. These measures were for the benefit of whites and *Métis*. Indian mission schools were established from 1833 on; a great impetus to this missionary work was given after 1845 when it was largely taken over by the Oblate Fathers..

Confederation (1867).— By the British North America Act of 1867 the provinces of Canada (Upper and Lower Canada becoming Ontario and Quebec), Nova Scotia and New Brunswick were united in federal union to form the Dominion of Canada. Other provices have since been added. Education was assigned to provincial control, but the provinces were prohibited from interfering with denominational rights as existent at the union, and the Dominion Parliament was empowered to redress any other infringements on the educational rights of religious minorities.

Ontario.— Elementary education is free and compulsory, and is provided by public and separate schools, both under state control. Since confederation the essential elements of the Catholic Separate School system have not been changed. Five or more Catholic heads of families in any locality may maintain a separate school and be exempted from public school rates. Trustees elected by the school supporters administer school business. Their revenues consist of (a) provincial grants, based on attendance, efficiency, etc., and distributed impartially among public and separate schools; (b) county and other municipal grants distributed on similar bases; (c) rates levied by the trustees on the property of separate school supporters; (d) voluntary contributions, chiefly from church funds. Teachers must have the same qualifications in separate as in public schools. By a decision of the Privy Council in 1906 religious teachers were made subject to this rule, from which they had hitherto been exempt. The older religious teachers were, by legislation of 1907, given, on certain conditions, permanent qualification. Religious instruction is under the supervision of the parish priests. Secular instruction is identical with that in the public schools, and the same standards of efficiency are imposed by the provincial Department of Education. Textbooks are the same, except in English literature, in which extracts from Catholic authors are more largely used, and to some extent in history. Since 1882 the Department has maintained a distinct board of separate school inspectors.

Secondary education is supported by the province partly through advanced classes in public and separate schools, but mainly through high schools. No separate high schools are recognized. Catholic secondary education is offered by private institutions, conducted generally by religious orders. There are 32 of these Catholic high schools, academies and colleges. Almost all such schools prepare candidates for the examinations set by the Department of Education, and many are inspected by provincial high school inspectors. The University of Ottawa, conducted by the Oblate Fathers, which was canonically erected by Pope Leo XIII in 1889, is the only active Catholic university. There are English and French courses in arts, and a course in theology. Regiopolis College, closed in 1869 and reopened 1896, offers only secondary instruction. Saint Michael's College, one of the federated arts colleges of the provincial University of Toronto, is the most important centre of higher education for English-speaking Catholics. It has the full benefit of the lectures and equipment of the university. University boards, on which Saint Michael's is represented, conduct the examinations — except that the college sets its own papers in philosophy — and confer the degrees. There are 9 professors and 140 students. Women students reside in Loretto Abbey College and Saint Joseph's College. Other colleges doing university work are Assumption College, Sandwich (founded 1855) and Saint Jerome's, Kitchener (1865). In northern Ontario colleges have been opened at North Cobalt (1912) and Sudbury (1913). The principal theological seminaries are Saint Augustine's, Toronto (1913), Saint Peter's, London (1912) and that attached to the University of Ottawa. In 1915 Ontario had 537 Catholic separate schools, with 1,389 teachers, 67,481 pupils and an average daily attendance of 45,733. The total receipts for the maintenance of these schools in the same year were $1,347,502, of which $42,131 was derived from provincial grants and $879,903 from municipal grants and assessments. The total expenditure in the same year amounted to $1,183,847, of which $503,946 was for teachers' salaries and $366,625 for sites and buildings. The expenditure per pupil enrolled amounted to $17.54.

Quebec.— The primary school system is denominational and separate: it is based on religion, and Catholics and Protestants have each a complete and independent organization, receiving equal proportional assistance from government. State control is exercised through the Council of Public Instruction as reorganized in 1876. It is divided into two committees, Catholic and Protestant. Everything relating specially to Catholic schools is within the exclusive jurisdiction of the Catholic committee. The committees meet together to consider matters of common interest. The Catholic committee consists of the superintendent of public instruction, the bishops of Quebec, an equal number of laymen appointed by the lieutenant-governor, and, since 1906, four associate members chosen from the primary school teachers. Primary schools include elementary schools, giving a four years' course; intermediate or model, two years; and superior, or academies, two years. They are "under control" or "independent and subsidized" according as they are administered by elected school boards or by other bodies. The province is divided into school municipalities, each electing its school commissioners. The revenues consist of (a) rates levied on property of Catholics; (b) fees; (c) provincial grants; (d) private funds of independent schools. Lay teachers must hold diplomas granted by the central board of examiners. The moral and religious supervision of Catholic schools is exercised by the parish priests. Secular studies are prescribed by the Catholic committee. Under it are a Catholic inspector general and divisional inspectors. Although education is neither free nor compulsory, the school attendance is good. In 1912–13, with a Catholic population of 411,701, of the ages 5 to 16 years, there was an enrolment in primary schools of 362,934 (including 4,520 over 16 years) and an average attendance of 287,403.

Secondary education is not under state control, but the province maintains a number of special schools. Among such Catholic institutions are normal schools — nine for women have been opened since 1905,—agricultural schools at Oka and Ste Anne de la Pocatière, a school for higher commercial studies at Montreal, schools for deaf-mutes and the blind, domestic science schools, night schools and schools of arts and manufactures. Catholic secondary education is offered by classical and commercial colleges conducted by ecclesiastics, 19 of which receive an annual subsidy of $1,000 each, and by convent academies for young ladies. The only university is Laval, which was canonically erected in 1876. It has faculties of theology, law, medicine and arts and affiliated professional and technical schools. A complete branch of the university was established in Montreal in 1879. Each branch receives a grant of $25,000, and the affiliated Polytechnic School $30,000. The Seminary of Quebec and the Grand Seminary of Saint Sulpice at Montreal constitute the theological faculty, and there are affiliated seminaries. The Sulpician Fathers, besides a college, a philosophical and a theological seminary in Montreal, have since 1888 maintained the Canadian College in Rome for advanced ecclesiastical studies. In 1915 there were 5,231 elementary schools, controlled 5,151, independent 80; with an enrolment of 211,672, and an average attendance of 166,125. There were 5,576 lay and 949 religious teachers. The model schools numbered 673; controlled 552, independent 121, with an enrolment of 105,831, an average attendance of 89,013; and 3,206 teachers, lay 922, religious 2,284. The academies were 283 in number, of which 128 were controlled and 155 independent. The student enrolment was 75,482, with an average attendance of 65,846; and 286 lay and 2,793 religious teachers. There are 13 normal schools, 2 for men and 11 for women; with 1,134 pupils and 173 teachers. There are three schools for the deaf, dumb and blind, with 515 pupils and 115 teachers. Schools of arts and trades number 11; with 2,515 pupils and 45 teachers. There are 48 night schools, with 3,640 pupils and 107 teachers. Universities and classical colleges comprise *Laval University, Quebec, 87 teachers, 474 pupils; *Laval University, Montreal, 234 teachers and 1,786 pupils; 21 colleges with 737 teachers and 7,788 pupils.

Nova Scotia.— Elementary schools are supported and controlled by the state, and no separate schools are recognized by law. Nevertheless in practice many of the public schools, especially in the cities and in Acadian districts, are really Catholic. The law permits the school boards to direct religious exercises to be held for a brief period within school hours, or, if objection is made, after school hours. By a good understanding among all classes, over 30 urban schools, accommodating about 10,000 pupils, are recognized practically as being Catholic, and are so conducted. Many of them are in charge of religious teachers. There are two academies for boys and 12 for young ladies. That attached to Saint Francis Xavier University is the county academy of Antigonish, and receives state support. Saint Francis Xavier University, Antigonish, though a small institution, maintains high educational standards. It has faculties of arts, law and applied science. Saint Anne's College, Church Point, is the chief centre of higher education for the French population. A theological seminary is maintained at Halifax. The four Catholic institutions of university rank in Nova Scotia have 54 professors and 500 students and the principal secondary schools, including Antigonish Academy, Mount Saint Vincent College and Sacred Heart College, Halifax; Our Lady of Lourdes School, Pictou, and Saint John Baptist Academy, New Glasgow, have 68 teachers and 1,105 students.

New Brunswick.— In 1871 the legislature, which had hitherto granted some assistance to Catholic education, established a non-sectarian system of public schools. The Catholic authorities unsuccessfully sought redress from the Dominion under the terms of the British North America Act. In 1875 a compromise was effected: urban school boards were permitted to lease Catholic school buildings, open public schools therein, and employ qualified religious teachers and others having the confidence of the Catholic clergy. Much the same working arrangement prevails in the towns and cities of New Brunswick as in Nova Scotia. There are 14 convent academies for young ladies, several preparatory boys' schools, and three classical colleges — Saint Joseph's, Memramcook (1864), which has the status of a university and forms an educational centre for the Acadian people; Sacred Heart College, Caraquet (1899), and Saint Thomas, Chatham (1910).

Prince Edward Island.— This province entered confederation in 1871, having then a public non-sectarian school system. There are no separate schools, but Catholics maintain a few private schools, including seven convent academies of the Congregation of Notre Dame and the classical college of Saint Dunstan's at Charlottetown.

Manitoba.— This province was created by an act of 1870 which, in terms resembling those of the British North America Act, guaranteed the permanence of all rights to denominational schools as then existent, and provided for an appeal to the Dominion against infringements of any other educational rights of the future religious minority. In 1871 a school system modeled on that of Quebec was established, with a board of education divided into Catholic and Protestant committees, 12 Catholic and 12 Protestant school sections, and an equal division of provincial subsidies. Later these grants were divided in proportion to school population. By 1890 Protestant school sections had increased to 629, Catholic to 90. In that year the legislature created a political department of education, and absorbed all schools into one non-sectarian system, to be supported by taxes which should be levied equally on all property-holders but applied only to schools conducted in accordance with the new regulations of the department. These prohibited all religious exercises except certain scriptural readings and prayers, approved by Protestants but not acceptable to Catholics. The judicial committee of the Imperial Privy Council decided in 1892 that the new laws were valid, as not infringing any right in existence in 1870. The Catholics then sought the other means of redress provided, an appeal to the Governor General. In 1895 the Privy Council declared their appeal to be, legally and materially, well founded, since there had been an infringement of rights acquired after 1870. In 1896 the Dominion government introduced into Parliament a bill to remedy the disabilities of Manitoba Catholics. Parliament's term expired before the bill was passed, and in the subsequent elections Wilfrid Laurier and the Liberal party, who had opposed the bill, were returned to power. Laurier, as Prime Minister of Canada, arranged a compromise under which the Manitoba schools are still administered. The trustees of a school may authorize some slight Catholic religious teaching, and one Catholic teacher must be employed in an urban school containing 40, or a rural school containing 25 Catholic pupils. The Pope, on the report of his special delegate, Mgr. Merry del Val, declared of the new settlement: «We have no doubt that these measures have been inspired by a love of fair dealing and good intention. But we cannot conceal the truth. The law made to remedy the evil is defective, imperfect, insufficient.» Catholics have never accepted the settlement as satisfactory, but have been compelled to acquiesce in it. The French bilingual school districts, 137 in number in 1916, enjoy considerable liberty and maintain schools practically Catholic. In Winnipeg, Brandon, and a few other centres, private parochial schools are kept open under great difficulties. There are Ruthenian parochial schools in Winnipeg and Sifton. Seventeen convent schools offer secondary education for girls. In 1909 a Lesser Seminary for boys aspiring to the priesthood was established at Saint Boniface. Higher education is offered by Saint Boniface College, which since 1877 has been a federated college of the University of Manitoba, holding a position somewhat analogous to that of Saint Michael's in the University of Toronto.

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*Figures for 1914. The totals for 1915 are: teachers 326, pupils 2,295.

British Columbia.— British Columbia entered confederation in 1870. Neither then nor since have separate schools been recognized. Catholics accepted without serious opposition the Public School Act of 1872, which organized a non-sectarian system, but protested strenuously, though unsuccessfully, against the School Tax Bill of 1876, which levied a special head tax for the support of these schools. Catholics maintain a number of private schools: 11 parochial schools, six academies for young ladies, and two colleges.

Saskatchewan and Alberta.— That portion of the Canadian West lying between Manitoba and the Rocky Mountains was in 1875 granted a certain local autonomy by the Northwest Territories Act, and in 1905 was formed into the provinces of Saskatchewan and Alberta. The Territories Act guaranteed to the majority in each district the right to establish such schools as they thought fit, with the concurrent right of the minoriy to establish separate schools. In 1884 the local legislature organized a school system resembling that of Quebec, with a Catholic and a Protestant section of the board of education, each supervising its own schools. Gradually this system was changed into one approximating to that of Nova Scotia, with the addition of a minority right to separate schools as in Ontario. Under the ordinance of 1901, which was the school law when the new provinces were created, education was administered by a political department of state, with a purely advisory educational council, two members of which must be Catholics. Religious instruction as directed by the trustees might be given during the last half-hour of the school day in public or separate schools. The religious minority in any section might establish a separate school. Thus the public school in a section predominantly Catholic may be as much a Catholic school as the separate school in one predominantly Protestant. These rights to religious instruction and to separate schools were made permanent by the Dominion acts creating the provinces of Saskatchewan and Alberta. In each province all government schools, Catholic and Protestant, public and separate, are under control of the provincial department of education, are subject to the same regulations and the same inspection, use the same courses of study and the same text-books and receive grants on the same conditions from the provincial treasury. In Saskatchewan the Catholic ratepayers of a section must support the Catholic school, if there is such. Complete statistics regarding these schools are not available. In 1915 there were in Saskatchewan 14 Catholic separate schools. There is a considerable number of private educational establishments, chiefly convent boarding schools. In Alberta there is a college, Saint Francis Xavier's, at Edmonton West, and a «Little Seminary» at St. Albert.

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23. LITERATURE. In any discussion of Canadian literature the first point one must settle is, What is Canadian literature? What are its essential characteristics? Is it the work of men and women living in Canada, whether born there or not; or must we confine it to the writings of native Canadians; is its essential characteristic to be that its matter relates in some way to Canada, whether the author be native or otherwise; or is it to be restricted to work that is in its distinctive manner Canadian? And, in any of these cases, is it to be understood as including the quite respectable body of French-Canadian literature? In one of the older countries, the first definition would of course be rejected at once as inadmissible; but the conditions are somewhat different in a young country such as Canada, where one must come down to comparatively recent times to find anything like a large proportion of its writers native born. Yet even in Canada it would be undesirable to accept the first definition without reservations. The second would obviously give but a very limited and inadequate view of the literary product of the country. The third both includes too much and excludes too much. The fourth definition has much to recommend it, but would be exceedingly difficult to apply, and if strictly adhered to would necessarily exclude many important books written by Canadians. Probably the safer plan to adopt here, as in so many other cases, is a compromise, to include the best of what is distinctively Canadian in tone, whether by native Canadian or by adopted Canadian, without excluding that which, otherwise meritorious, is not peculiarly Canadian either in manner or matter. Finally, one can not justly or logically confine a survey of Canadian literature to that which has been written in English. Quebec is as much a part of the Dominion as Ontario, and the literature of the French-speaking province cannot be ignored unless one is prepared to set aside a large and important part of the intellectual product of the country.

Canadian literature, both English and French, has the weaknesses, as well as some of the elements of strength, of a young country. Much of it is crude, particularly that produced in the early pioneer days of the colony. At the same time one finds evidence of a broader outlook, a tone and treatment less trammelled by artificial conventions, than is always noticeable in the literatures of older countries. As the country has developed, the crudity has largely disappeared, and at the same time much of the best of what has been produced in Canada since confederation, that is, within the last 50 years, retains the freshness, the atmosphere of youth, the virility, that helped to redeem the literary product of pioneer days from hopeless mediocrity. With a few exceptions, this sketch of Canadian literature will be confined to the confederation period. No attempt will be made to include all the writers, or even all the meritorious writers, of the last half century; the object the writer has in view is rather to consider briefly the work of a few, whose achievement may be taken as fairly representative of the quality and development of Canadian literature.

Of Canadian writers whose work was produced in the years before confederation, one stands preëminently first — Thomas Chandler Haliburton (q.v.). Indeed, it would be equally true to say that Haliburton stands head and shoulders above any other writer that Canada has produced up to the present time. He approached more nearly to the rank of true genius than any other Canadian. He was born in Windsor, Nova Scotia, in 1796; was educated at King's College, in his native town; practiced law in the ancient town of Annapolis; for some years sat on the Supreme Court bench of his province; removed to England in 1856, and became a member of the British House of Commons. He died at his beautiful home on the banks of the Thames in 1865.

Haliburton's life was in every sense a full one. In law, politics and literature, his brilliant intellect and forceful personality put him among the leading men of his generation. He was an ardent Imperialist, and at the time when the Little Englander had things all his own way in the British Parliament, he preached the doctrine of a Greater Britain, and blazed the way for a closer union between the mother country and her overseas dominions. As a Nova Scotian, he was a firm believer in the human and material resources of his native province, and used all the power of his virile pen to stimulate the ambition of his fellow-countrymen and drive them out of the narrow groove of provincial self-sufficiency into which they had fallen. The influence of Haliburton's writings extended far beyond the boundaries either of his own province or his own generation.

Haliburton was the author of three works of an historical nature, 'Historical and Statistical Account of Nova Scotia' (1829), 'The Bubbles of Canada' (1837) and 'Rule and Misrule of the English in America' (1851). His lasting reputation, however, rests upon his works of fiction, or rather of humor. He has been called the “father of American humor.” It is hardly too much to say that he was the greatest humorist America has yet produced. He did not depend upon exaggeration to produce the effects he sought. His writings are marked by both wit and wisdom. His humor is always genial. His satire is kindly, constructive rather than destructive. He can be caustic enough when laying bare hypocrisy, but never loses sight of the generous purpose that actuated all his works. There is very little plot in any of his books, but his character drawing is inimitable. Sam Slick has been rightly described as “among the best imaginative creations of modern times.” But Haliburton will probably be remembered chiefly by reason of the aphorisms and epigrams that abound in his works. Many of them have become part of our everyday speech. He indeed anticipated more than one famous saying of later writers. The remark of the country girl in 'The Clockmaker,' “I guess I wasn't brought up at all, I growed up,” appeared a dozen years before it was repeated in 'Uncle Tom's Cabin'; and Sydney Smith's famous aphorism really belongs to Sam Slick, whom we find saying, “Ain't this a hot day? I do wish I could jist slip off my flesh and sit in my bones for a space, to cool myself.” It would be idle to attempt to bring together here, even if it were desirable, the many wise and witty sayings that Haliburton puts into the mouth of Sam Slick and his other characters. Two or three examples will serve the purpose: “The skin is nearer than the shirt”; “power has a nateral tendency to corpulency”; “what people hope for, they think at last they have a right to”; “a nod is as good as a wink to a blind horse”; “a man who is a slave to his own rules is his own nigger”; “a woman has two smiles that an angel might envy; the smile that accepts a lover before words are uttered, and the smile that lights on the first-born baby and assures him of a mother's love.” Haliburton's first book of humor was 'The Clockmaker; or, The Sayings and Doings of Sam Slick of Slickville,' which first appeared in book form in Halifax, in 1837. It was followed by 'The Attaché' (1843–44); 'The Old Judge' (1847); 'Wise Saws and Modern Instances' (1853); 'Nature and Human Nature' (1855). There were several others, but these contain his best work. 'The Clockmaker' was translated into German, and 'The Old Judge' into both French and German.

Putting aside several more or less feeble essays in Canadian history, we find in Christie's 'History of Lower Canada' (1848–55) the first noteworthy attempt, after Haliburton, to tell the story of a portion of British North America. Robert Christie (1788–1856) was, like Haliburton, a native of Windsor. He also practised law, and took an active part in the political life of his country. But there the resemblance ceased. As a writer he is almost unbelievably dull. Yet his history is valuable, for Christie was a careful and impartial historian, and made full use of the documentary material that he had collected, and much of which has since been lost.

John Charles Dent (1841–88), in his 'Last Forty Years' (1881), deals with the history of the country from the Union of 1841, where Christie leaves off, down to the year 1881. Dent was as conscientious and painstaking as his predecessor, and had the added qualification of a clear and attractive literary style. He also wrote 'The Story of the Upper Canadian

Rebellion' (1885), an admirable work, though somewhat controversial in tone. Dent was no admirer of the fiery leader of the rebellion, William Lyon Mackenzie, and lost no opportunity of expressing his feelings.

The most ambitious work of history yet produced in Canada is 'The History of Canada' of William Kingsford (1819–98). Kingsford was 65 years of age when he began the preparation of his great work, and he toiled at it continuously for over 13 years, living to see its completion, in 10 bulky volumes. His history is heavy in style, and not always to be relied upon on minor points, but generally speaking it is authoritative, and indispensable to the student of Canadian history.

A number of short popular histories of Canada have been written within the last 20 or 25 years, a few of which only are of sufficient importance to mention here. George Bryce's 'Short History of the Canadian People,' first published in 1887, and recently brought down to date, is a useful and readable work, in the manner of Green's history, though hardly comparable in style. Charles Roberts, better known as a Canadian poet and novelist, is also the author of a very readable 'History of Canada.' A third work of the same class is Sir John Bourinot's 'Story of Canada,' in the 'Story of the Nations' series.

Among more recent works dealing with individual phases of the history of Canada, much the most notable is 'The Siege of Quebec,' by Arthur G. Doughty, the Dominion archivist, and George W. Parmelee. The work, in six large volumes, is a monument of research, and must always remain the unquestioned authority in its particular field. It covers, with most minute care and scholarly accuracy, every detail of the historic siege of 1759, so far as the land operations are concerned. A companion work is William Wood's 'Logs of the Conquest of Canada,' dealing in the same scholarly way with the naval side of the siege. Colonel Wood has told the story of the siege, with equal charm and accuracy, in his 'The Fight for Canada.'

Dr. Doughty has shown in his three shorter works, 'Quebec under Two Flags,' 'The Cradle of New France' and 'The Fortress of Quebec' that an archivist, without sacrificing any of his scholarly principles, may, when he possesses the ability, put life and color into the dry bones of history.

The War of 1812 has been the subject of a number of histories written by Canadians and from a Canadian point of view. In fact, the most serious criticism that must be brought against most of them — a criticism that applies equally to many of the attempts by American writers to deal with the same conflict — is that they are hopelessly partisan and one-sided. To this class belong the histories of William F. Coffin, Gilbert Auchinleck and James Hannay. A much better piece of work is the 'War of 1812' of Major John Richardson (1796–1852). It inevitably has the defects of a book written by one who had taken part in the campaign, but Richardson, like most honest soldiers, was not a bitter partisan, and he had the advantage of being a trained writer as well as a soldier. In 1902 A. C. Casselman brought out a new edition of Richardson's History, enriched with copious notes, an excellent biography and a full bibliography. Another very readable and useful book of Richardson's is his 'Eight Years in Canada,' which covers the period of Lord Durham's mission to Canada, and the administrations of Sydenham and Metcalfe.

Two words that admirably illustrate the modern scholarly method of writing history, are Sir C. P. Lucas' 'Canadian War of 1812,' and 'A History of Canada, 1763–1812.' Lucas has made excellent use of the splendid collections of documentary material in the Dominion Archives, brought together by the late Douglas Brymner and his worthy successor, Arthur G. Doughty, and on the whole, for the two periods of which he treats, his works will probably remain, for some time at least, the best available. With Wood's 'Fight for Canada' they form an entirely satisfactory treatment of the history of Canada from the Conquest down to the close of the War of 1812.

Charlevoix and Lescarbot, Champlain, Lahontan and Hennepin, although their books relate to the earliest history of Canada, can scarcely be regarded as Canadian writers. The first noteworthy history by a French-Canadian was the 'Histoire du Canada sous la domination Française' (1843), followed the next year by 'Histoire du Canada sous la domination Anglaise,' both by Michel Bibaud (1782–1857). Between 1845 and 1848 appeared a much more important work, one that still ranks as the best general history of the country in French, the 'Histoire du Canada' of François Xavier Garneau (1809–66). Garneau's influence was marked upon the intellectual life of French Canada. In 1852 he brought out a new edition of his work, carrying the narrative down to the year 1840, the first edition having stopped at 1792. The history is now being reprinted, with an introduction and very full notes by the historian's grandson, Hector Garneau, and a preface by Gabriel Hanotaux. It has also appeared in an English translation, by Andrew Bell.

Other notable historical works in French, are the 'Cours d'Histoire du Canada' of the Abbé J. B. A. Ferland (1805–65); 'Dix ans d'Histoire du Canada, 1840–50,' by Antoine Gérin-Lajoie (1824–82); 'Canada sous l'Union,' by Louis Philippe Turcotte (1842–78); 'L'Histoire de Cinquante Ans' of T. P. Bedard (1844–1900); and the 'Histoire des Canadiens Français,' by Benjamin Sulte. The Abbé H. R. Casgrain (1831–1904) was the author of several historical works, dealing with special phases of Canadian history, and marked by charms of style that make them delightful reading.

With a few exceptions, biography in Canada has been confined to the lives of men closely identified with the political history of the country. An important series of biographies, published in 1906, is 'The Makers of Canada,' in 20 volumes, each by a well-known Canadian writer. While inevitably unequal in style and treatment, they are all readable and trustworthy. Adam Shortt's 'Lord Sydenham,' D. C. Scott's 'John Graves Simcoe,' Jean N. McIlwraith's 'Sir Frederick Haldimand,' W. D. LeSueur's 'Frontenac,' George R. Parkin's 'Sir John Macdonald' and John Lewis' 'George Brown,' are particularly worth mentioning. Of earlier works of biography, two of the most valuable are Sir Joseph Pope's 'Memoirs of Sir John Alexander Macdonald,' and Sir J. S. Willison's 'Sir Wilfrid Laurier and the Liberal Party.' Another admirable piece of biography is Charles Lindsey's 'Life and Times of William Lyon Mackenzie.' Several attempts have been made to write the life of the brilliant Nova Scotian statesman, Joseph Howe, but none are altogether satisfactory. The best, at any rate from a literary point of view, is the sketch by the late Principal Grant, published in 1904. One of the best of more recent Canadian biographies is George M. Wrong's 'Life of Lord Elgin.'

Biography in French Canada has generally been in the form of brief sketches, or collections such as Abbé Casgrain's 'Biographies Canadiennes,' Bibaud's 'Le Panthéon Canadien' and David's 'Biographies et portraits.' Notable exceptions are the lives of Papineau and Cartier, by the learned Librarian of Parliament, Dr. A. D. DeCelles; and Thomas Chapais' 'Jean Talon' and 'Montcalm.' Gravier's 'Vie de Samuel Champlain' is an admirable piece of work, but can hardly be classed in Canadian literature.

Some of the most important books of travel are associated with the early history of Canada, or of what is now Canada. Excluding the entertaining narratives of those who were merely visitors, there remain such remarkable works as Alexander Mackenzie's 'Voyages from Montreal through the Continent of North America' (1801); Bouchette's 'British Dominions in North America' (1832); Franchère's 'Voyage to the Northwest Coast of America' (1854); Harmon's 'Voyages and Travels in the Interior of North America' (1820); Paul Kane's 'Wanderings of an Artist among the Indians of North America' (1859); Grant's 'Ocean to Ocean' (1873); Mrs. Moodie's 'Roughing it in the Bush' (1852); and among more recent works, J. W. Tyrrell's 'Across the Sub-Arctics of Canada'; Coleman's 'The Canadian Rockies'; S. E. Dawson's 'The Saint Lawrence Basin and Its Border-Lands'; and L. J. Burpee's 'Search for the Western Sea.'

French-Canadian books of travel are represented by such readable works as the Abbé Casgrain's 'Un pèlerinage au pays d'Evangeline' (1887); Sir Adolphe Routhier's 'En Canot' (1881) and 'De Québec à Victoria' (1893); Faucher de St. Maurice's 'De Québec à Mexico' (1866); and Arthur Buies' 'Récits de Voyages' (1890) and 'Au Portique des Laurentides' (1891).

English-Canadian verse seems to have had its beginning in Nova Scotia, where in 1825 Oliver Goldsmith, a distant relative of his more famous namesake, published 'The Rising Village.' The poem, in manner an imitation of 'The Deserted Village,' records not unsuccessfully or without a certain effectiveness the rude pioneer life of the author's native province. With Charles Sangster (1822–93) came something more of skill in the art of poetry. His 'Saint Lawrence and Saguenay' (1856) and 'Hesperus' (1860), contain patriotic and other verse of some merit, simple, unpretentious, not very rich in ideas, but eminently sincere. A poet of an entirly different type, and of much greater power, was Charles Heavysege (1816–76). Heavysege published several volumes of verse, including a number of remarkable sonnets, but the work by which he is remembered is his dramatic poem 'Saul,' first published in 1857. This is an elaborate piece of work, divided into three parts, each of five acts, and altogether about 10,000 lines. Heavysege was not an educated man, in the ordinary acceptance of the term, but his mind was saturated with the Bible and Shakespeare, and there are passages in 'Saul' not unworthy of either the sacred book or the great Elizabethan. Saul's vision, on the eve of his death, forms one of the most dramatic passages in English literature. Longfellow described Heavysege as the greatest dramatist since Shakespeare, and Coventry Patmore, perhaps a more discriminating critic, praised 'Saul' scarcely less unreservedly. Isabella Valancy Crawford (1851–87) published one slim volume of verse during her lifetime which, though it won her no recognition, contains verse of quite exceptional quality, sincere, musical, instinct with the poetry of common things. George Frederick Cameron (1854–85) was the author of a number of poems, which were collected and published after his death. He was a passionate opponent of tyranny and oppression, and one finds in many of his verses the lyrical expression of his sympathy with lost causes.

The year 1880 has been said to mark the Canadian Renaissance, because in that year appeared the first volume of poetry of one of a group of singers destined to put Canadian literature on a higher plane than it had hitherto reached. In this group are included Charles Roberts and his cousin Bliss Carman, Archibald Lampman, William Wilfred Campbell, and on or two others. Roberts' versatile genius has found expression in history, fiction and essays, but he is pre-eminently a poet. His verse, always scholarly and polished, gained steadily in power with the years. At first limited to classical themes, and more or less imitative, Roberts' more mature work gives expression to the atmosphere and color of Canadian woods and hillsides, the salt sea air of the Tantramar perhaps, and the problems of man's physical and moral contact with nature. The development of his genius may be readily traced from his earliest work in 'Orion' (1880), through 'In Divers Tones' (1886) and 'Songs of the Common Day' (1893), until it reached its highest point in 'The Book of the Native' (1897). Equally striking in their lyrical interpretation of Canadian scenes are the poems of Carman, contained in such of his books as 'Low Tide on Grand Pré' (1893), 'Behind the Arras' (1895), 'Ballads of Lost Haven' (1897) and 'Pipes of Pan' (1905). Carman's verse, like that of Roberts, reveals the influence of Shelley and Keats, and perhaps Tennyson; but each of these Canadian singers has a voice that is essentially his own. Each sat at the feet of the masters as humble student, but with the growth of knowledge and experience put his own distinctive personality into the interpretation of themes old and new. Campbell's earlier work, in 'Lake Lyrics' (1889) reveals many of the qualities that mark the verse of Roberts and Carman. What they had done to interpret the spirit of the Fundy shore, he achieved for the great inland seas. In his later books, 'The Dread Voyage' (1893) and 'Beyond the Hills of Dream' (1899), he strikes a more definitely human note, and touches with an assured hand many of the great problems of life. His two dramas, 'Mordred' and 'Hildebrand' (1895) are powerful in conception, though somewhat unequal in treatment. Of all this group of modern Canadian poets, Lampman (1861–99) probably stood first as an interpreter of Canadian scenery. He was a poet first and always. Most of his short life was spent in and about Ottawa, and he knew intimately every beautiful nook and corner of the countryside. His gentle personality breathes through every line of the almost flawless lyrics he left behind. As William Dean Howells said of him: "His pure spirit was electrical in every line; he made no picture of the Nature he loved in which he did not supply the spectator with the human interest of his own genial presence, and light up the scene with the lamp of his keen and beautiful intelligence." Only two slim volumes of verse were published during his lifetime, 'Among the Millet' (1888) and 'Lyrics of Earth' (1896); but after his death his friend and fellow-poet, Duncan Campbell Scott, gathered together with loving care all of his work that seemed worthy of preservation and published it with an admirably judicious memoir.

Two other Canadian poets must be mentioned here. Each stands in a class by himself. Robert Service has put into his three books of verse, 'Songs of a Sourdough,' 'Ballads of a Chechako,' and 'Rhymes of a Rolling Stone,' much of the strange fascination of the Yukon, its magnificent mountain scenery, the cruel beauty of its winter nights, the brutality as well as the primitive virtues of the mining camps. William Henry Drummond (1854–1909) discovered to the world the simple, picturesque figure of the Canadian *habitant*, the peasant of French Canada. In 'The Habitant,' 'Johnny Courteau' and 'The Voyageur,' he interpreted with kindly sympathy, tender pathos and inimitable humor the life and character of the shrewd and simple-minded farmer of Quebec.

As one finds in the poetry of English-Canadian writers evidence of the influence of Shelley, Keats and Tennyson, so the work of French-Canadian poets reveals their indebtedness to Victor Hugo, Lamartine and Musset. Octave Crémazie (1827–79) is justly regarded as the father of French-Canadian poetry. He has only one volume of verse to his credit, and that was published by his friends after his death, but the sincerity and lyrical quality of his poems, no less than the spirit of patriotism with which they are instinct, have made them an inspiration to his fellow-countrymen. Louis Fréchette (1839–1908), more versatile and polished than Crémazie, left behind him a larger body of credible verse than any of his contemporaries. His first volume of poetry, 'Mes Loisirs,' appeared in 1863, and this was followed by 'Voix d'un Exilé' (1869), 'Pêle-Mêle' (1877), 'Fleurs boréales' and 'Oiseaux de Neige' (1879); 'La Légende d'un Peuple' (1887, and 'Feuilles volantes' (1891). Before his death he prepared a collected edition of all his verse that he wished to be preserved. He was essentially a lyrical poet, but, like Crémazie, avoided the passion of human love, making in this sense the sharp line of cleavage between the romantic school of France and the poets of French Canada, who in other respects looked to them for inspiration. Fréchette was beyond question the greatest poet that French Canada has yet produced. A contemporary of his, Pamphile Le May, with less fine craftsmanship and versatility than Fréchette, but a more vivid imagination, has won for himself a secure place in the hearts of Canadians. He sings the songs of the people, he is a poet of the soil. In 1865 he published his 'Essais poétiques.' This was followed by a fine translation of 'Evangeline' (1870); 'Les Vengeances' (1875); 'Fables Canadiennes' (1881); 'Petits Poèmes' (1883), and 'Gouttelettes' (1904), the last a remarkable collection of sonnets. Another member of the same group was William Chapman — a true French-Canadian despite his English name. Chapman (1850–1917) put much very creditable verse into his four books, 'Les Québecquoises' (1876); 'Feuilles d'Érable' (1890); 'Aspirations' (1904), and 'Les Rayons du Nord' (1910). In 1895 a new school of French-Canadian literature had its birth in Montreal, of which Emile Nelligan and Albert Loseau are the most notable exponents. These modern Canadian poets have attempted to transplant the spirit of Verlaine and Beaudelaire in the not altogether congenial atmosphere of Quebec. Yet they have produced some work of much more than passing interest.

It is impracticable here to do more than indicate very briefly the work in fiction thus far achieved by Canadians. James de Mille (1836–80) found leisure amid the preoccupations of his life as a college professor to write a number of romances and tales, the best of which were 'Helena's Household' and 'The Dodge Club.' William Kirby (1817–1906) was the first Canadian novelist to make use of the rich mine of romantic material offered by the early history of his country. His one romance, 'The Golden Dog,' still remains in many respects the best thing of its kind produced in Canada. Sir Gilbert Parker stands easily first among Canadian novelists. Since the publication of 'Pierre and His People' in 1892, he has written a succession of novels, romances and short stories, all good of their kind, and most of them dealing with some phase of Canadian life or history. Charles W. Gordon (Ralph Connor) has given us in 'Black Rock,' 'The Sky Pilot,' and his later novels, admirable pictures of life in the backwoods, lumber camps and mining camps of Canada. Norman Duncan in 'Dr. Luke of the Labrador,' and his fine series of boys' stories, has written of the sea and those who make their home upon its waters. Charles Roberts, already considered as a poet, is also favorably known as the author of a large number of very readable romances and short stories. Lucy Maud Montgomery (Mrs. McDonald) has made the little province of Prince Edward Island famous by her altogether delightful stories, 'Anne of Green Gables' and its successors. It may be convenient to include here the works of Stephen Leacock, who is perhaps rather a humorist than a novelist, and perhaps rather a wit than a humorist. His 'Literary Lapses,' 'Nonsense Novels' and 'Sunshine Sketches of a Little Town,' are brilliantly clever essays in a field that has hitherto been untried in Canada.

In French-Canadian fiction Philippe Aubert de Gaspé stands pre-eminent. He wrote only one romance, 'Les Anciens Canadiens,' but that is almost a national epic, and altogether a remarkable piece of work. He began to write it in his

74th year. "De Gaspé," says Camille Roy, "is at once the most eloquent, the most simple, the most charming narrator of Canada's past — the true epic singer of a marvellous phase of its history." 'Les Anciens Canadiens' was translated into English by Charles Roberts. P. J. O. Chauveau wrote in 1853 one of the first Canadian novels, 'Charles Guérin,' a not very remarkable novel of manners. Antoine Gérin-Lajoie's 'Jean Rivard' is of the same type, but more successful as a true picture of the life of a French-Canadian *habitant*. G. B. de Boucherville was the author of a very readable novel, 'Une de perdue et Deux de trouvées.' Other novels with a purpose are J. P. Tardivel's 'Pour la Patrie'; Ernest Choquette's 'Claude Paysan,' and Hector Bernier's 'Au large de l'Ecueil.' Among the best examples of the historical novel in French Canada are Joseph Marmette's 'Charles et Eva,' 'François de Bienville,' 'L'Intendant Bigot,' and 'Le Chevalier de Mornac'; Napoleon Bourassa's 'Jacques et Marie'; Mlle. Angers' 'L'Oublie'; and Sir A. B. Routhier's 'Le Centurion.'

What Camille Roy has written of French-Canadian literature may very fairly be said of the entire body of Canadian literature. It has no doubt at times been unduly imitative, yet "it must be acknowledged that, taken as a whole, the literature is indeed Canadian, and that in it the life of the people is reflected and perpetuated. Many of its works, the best in prose and in verse, breathe the perfume of the soil, and are the expression — original, sincere and profound — of the Canadian spirit."

In closing this sketch it is proper to refer to some of the intellectual influences that have helped to make Canadian literature what it is. First of these are the universities. McGill and Laval in Quebec, Toronto and Queen's in Ontario, King's and Dalhousie in the maritime provinces, to mention but a few of the more prominent colleges, have had an increasing influence in moulding the intellectual life of the Dominion. The establishment of the Dominion Archives at Ottawa, and provincial archives at Toronto, Victoria and other provincial capitals, with their growing treasures of documentary material, has helped to turn Canadian historians from secondary to original sources, and to make their product more scholarly and more accurate. In this and other ways one sees also the influence upon Canadian writers and Canadian literature of such societies as the Royal Society of Canada, the Ontario Historical Society, the Royal Canadian Institute, the Quebec Literary and Historical Society, the Nova Scotia Historical Society and the Champlain Society; and of such periodicals as the *University Magazine, Revue Canadienne* and *Canadian Magazine,* and the annual *Review of Historical Publications Relating to Canada.* Nor, finally, should we overlook the peculiar influence of two great writers who for many years were closely associated with Canada, and who each in his own way did much for Canadian scholarship — Francis Parkman and Goldwin Smith.

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24. CANADIAN UNIVERSITIES. There are in Canada 22 universities, and some of these have federated and affiliated colleges. As each of the universities and colleges mentioned in this article is separately dealt with under its own name only a general summary, following the line of the provinces from east to west, is attempted here.

Maritime Provinces.— The University of King's College, Nova Scotia — the oldest university in the British overseas dominions — had its rise in the foundation of an academy at Windsor in 1788 by the provincial legislature. In the following year an act was passed incorporating King's College, and in 1802 it received a royal charter and a provincial grant. It was founded as an Anglican institution — a character it still retains. One of its statutes provided that "no member of the university shall frequent the Romish Mass, or the meeting-houses of Presbyterians, Baptists, or Methodists, or the Conventicles or places of worship of any other dissenters from the Church of England." As three-fourths of the population came under this comprehensive "test," an agitation was speedily set on foot for its removal, which failing, Pictou Academy was founded in 1816 as an undenominational college. Two years later Dalhousie College was founded at Halifax as a provincial university modeled on the Scottish pattern, and was opened for teaching in 1838. An applicant for a position on the original teaching staff of Dalhousie College was a distinguished Baptist, the Rev. Dr. Crawley, but as his application was not entertained — it was alleged on sectarian ground — and the Baptists were unrepresented on the staff, the drastic remedy was taken of founding (1838) a denominational institution, Acadia College, Wolfville. The Presbyterian College, established in affiliation with Pictou Academy in 1820, has made no fewer than four migrations, and is now located at Pine Tree Hill, near Halifax. Saint Francis Xavier College was founded at Antigonish in 1854, and is the chief Roman Catholic foundation in the maritime provinces. Other institutions belonging to the same communion in Nova Scotia are Saint Mary's College, Halifax, founded in 1860; College Sainte Anne, founded on behalf of the French population by the Eudist Fathers in 1890; and the Seminary of the Holy Heart, founded at Halifax in 1895, also by the Eudist Fathers. Two attempts have been made to unify the university system of the province by the foundation of a University of Halifax, embracing all the degree-conferring colleges of the province, but these have been unsuccessful. New Brunswick College was founded at Fredericton in 1800 as an Anglican institution; in 1829 it received a charter as King's College, and in 1859 it became undenominational and received a charter as the University of New Brunswick. The University of Mount Allison College was founded in 1862 to serve the higher educational needs of the Methodists of the maritime provinces; and in 1864 Saint Joseph's College, Memramcook, was established by the Roman Catholics for the Acadians and others of that communion.

Quebec.—McGill University, Montreal, had its origin in the bequest by James McGill, a public-spirited citizen of Montreal, of land and buildings on the outskirts of Montreal, and the sum of £10,000 for university purposes. The college received a royal charter in 1821, was formally opened in 1829, and has always been undenominational. The University of Bishop's College, Lennoxville, is an Anglican institution, was founded as a high school in 1843, and received a royal charter as a university in 1853. Laval University, Quebec, was founded in 1852 and named in honor of the first bishop of New France, who founded the seminary of Quebec in 1663, and of which it is the legitimate descendant. This university has a branch establishment, or second seat, at Montreal.

Ontario.—Governor Simcoe was the first to propose the establishment of a university in Upper Canada, but it was long after before any scheme took definite shape. The contiguity of the province to the United States, the high educational standard even then attained in that country, and the absence of educational facilities in upper Canada, forced the well-to-do to send their sons across the border for education, where, at the formative period of their lives, they were subjected to the influence of American textbooks and American teachers and breathed the atmosphere of an anti-British democracy—a condition of affairs that was little to the liking of the zealous church-and-state men who formed the official class in Upper Canada. John Strachan afterward Anglican bishop of Toronto, obtained in 1827 a royal charter for the founding of King's College, which was to be an Anglican institution, subscription to the Thirty-nine Articles being a condition for the holding of office by the staff and council. This attempt to establish an Anglican monopoly in higher education was as hotly resisted by the majority of the people of Upper Canada was the endeavor to create a monopoly in religious endowments, and gave rise to an educational controversy that continued for 22 years. Little was accomplished toward founding the college for a number of years; in 1837 an amended charter abolished the denominational test, but left the sore open by permitting the theological chair to remain in Anglican control. In 1843 King's College began operations in Toronto. Other colleges were concurrently founded under denominational auspices. Regiopolis College was founded by Bishop Macdonell at Kingston as a Roman Catholic institution in 1837, but owing to financial difficulties, closed its doors in 1869. Queen's College, Kingston, a Presbyterian institution, was incorporated in 1839 and began the work of teaching in 1842 in a "clapboard building." Victoria College, a Methodist institution, was incorporated by act of Parliament in 1841 and opened at Cobourg in 1843. Knox College, Toronto, which derived its impulse from the Scottish Church disruption of 1843, was opened by the Free Church of Scotland in 1844. Saint Joseph's College, Ottawa (College of Bytown), was founded by Bishop Guignes of Ottawa as a Roman Catholic institution, and erected into the University of Ottawa in 1866. Between 1843 and 1849 five legislative attempts were made to deal comprehensively with the university problem, and in the latter year the Baldwin Act completely secularized King's College and transformed it into the University of Toronto. Bishop Strachan, now an old man of 72, faced the new situation, which imposed a "godless university" on the province, with indomitable courage; he proceeded to England and after a vigorous campaign obtained a royal charter in 1852 for the University of Trinity College, which remains to this day a monument to his pertinacity and embodies his ideals in higher education—a denominational, collegiate and residential institution modelled on Oxford and Cambridge, in preference to the professorial teaching of the Scottish university system of which he was himself the product. Huron College (now the Western University) was established at London in 1863, and Wycliffe College, Toronto, was founded in 1879 by the Low Church party, both being offshoots of Trinity College. Saint Michael's College, Toronto, was founded as a Roman Catholic institution by Bishop Charbonnel in 1851. A bill introduced into the Parliament of United Canada, by Mr. (afterwards Sir Francis) Hincks, providing for the separation of the teaching function from that of examining and conferring degrees, received the royal assent in April 1853, and from that date until federation University College represented the teaching side of the University of Toronto. In 1860 a Baptist college was opened at Woodstock, the theological teaching in which was later merged in McMaster University, Toronto, founded by the munificence of Senator William McMaster, and which obtained a charter in 1887. The provision of denominational colleges in Ontario was thus more than ample and had vastly outrun the means of subsistence, and meantime adequate funds with which to finance the expensive modern equipment in science and medicine were urgently required. A movement for federation had been gathering force since 1874, and 10 years later it took active shape when Mr. G. W. (afterwards Sir George) Ross, the then provincial minister of education, summoned a meeting representative of the various colleges, to consider the question. Following on a series of discussions extending over three years, a federation act was passed in 1887, under which all the federating colleges find representation on the senate of the University of Toronto. The theological colleges of Wycliffe, Knox and Saint Michael's were the first to accept federation; Victoria entered in 1890; and the medical faculty of Trinity University was incorporated in 1903. Queen's University, which ceased to be a distinctly Presbyterian institution in 1912, and McMaster University remain ouside federation.

Prairie Provinces.—The University of Manitoba was first established at Winnipeg in 1877 as a federation of denominational colleges on the model of London University — the constituent colleges being those of Saint Boniface (Roman Catholic), Saint John's (Anglican), and Manitoba (Presbyterian). Wesley College (Methodist) became affiliated in 1888. The University of Saskatchewan was founded at Saskatoon in 1909, when Emmanuel College, Prince Albert, which was originally founded by Bishop McLean in 1879 as a college for native helpers, was transferred to that city. The University of Alberta was founded by the provincial legislature in 1906, provision was made for a site at Edmonton in 1907, and the first session opened in 1908.

British Columbia.— In 1907 an act was passed by the provincial legislature setting apart lands as a university endowment, in the following session the institution was incorporated, and in 1915 it was opened at Vancouver.

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25. RELIGIOUS CONDITIONS.

The religious and ecclesiastical life of Canada cannot be understood without some reference to the sources from which it sprang. The same great forces and influence which molded the history of the Old World re-appear here, but modified in their action and combinations by the new and freer environment in which they work. Broadly speaking, the three great British peoples which form the bulk and basis of the Dominion, brought with them the Anglican, Presbyterian and Methodist forms of religion, while latterly the tides of alien immigrants have brought with them varieties of the Eastern and Western Catholic churches. The dominating religious life of Canada is Protestant, save in the province of Quebec which is almost exclusively Roman Catholic and French-speaking. As a whole Canada is distinctively a Christian country, not so conservative on the one hand as Great Britain, or on the other hand so liberal as the United States, 85 per cent of the population belonging to the Roman, Presbyterian, Methodist and Anglican churches.

General History.— The Roman Catholic Church is the oldest and largest of the ecclesiastical bodies in Canada. It has its chief seat in the province of Quebec. In Canada, under French rule, it was all-powerful, and in its origin it was distinctively missionary. The Jesuits were the pioneers and, from the Saint Lawrence to the Rockies, have left an imperishable record. While to-day the largest section by far of the Roman Catholic is French speaking, a considerable body of Roman Catholics is found in the other provinces representing in their lineage and traditions the Catholics of the north of Scotland and south of Ireland. In the western provinces from Winnipeg to the Pacific the Roman Catholic Church is strong in influence and membership. See the article on the Roman Catholic Church.

The Church of England in Canada began with the settlement in Nova Scotia (known of old as Acadia) of certain English immigrants who came in government ships to Halifax in 1749, and built Saint Paul's Church for the peoples' worship (1750). The incoming of the United Empire Loyalists (Americans who determined to remain loyal to the British Crown) in 1783–84 gave a great impetus to the Church of England, for the vast majority of them were Episcopalians, and in 1787, Dr. Chrales Inglis was consecrated in Lambeth in England, as bishop of Nova Scotia, the first bishop of the Church of England in Canada. His diocese included New Brunswick, Newfoundland, Prince Edward Island and Upper and Lower Canada. In the year 1793 Dr. Jacob Mountain was consecrated as bishop of Quebec, and all Canada west of Quebec was under this jurisdiction until 1839 when Dr. John Strachan was made bishop of Toronto, the Anglican population of Upper Canada comprising his episcopate. About this time the new Canadian spirit of the church began to manifest itself. Before this the Anglican Church had depended for its support largely upon the charity of the missionary organizations of the mother church in England, especially the Society for the Propagation of the Gospel, but in 1842 it was felt that self-respecting Canadian churchmen should begin to support their own church and ministry, and the Church Society of the Diocese of Toronto became the pioneer of the system of parochial self-support now almost universal in the Canadian church. Another very remarkable event in the life of the Canadian church was the emergence of the democratic and independent spirit of self-government. All the bishops of the Anglican Church in Canada were accustomed to receive their commission from the British government, and their consecration in England, and the members of the church had nothing whatever to say in the matter. But after no little discussion and difficulty the Canadian bishops determined to have their own jurisdiction and synods, and in the years 1857–59 asserted their ecclesiastical independence by holding synods in Toronto and Quebec where the clergy and laity meeting on equal footing might transact the affairs of the church. The year 1862 marked also a new era in the history of the Canadian Church, for in that year Dr. Lewis was elected bishop of the diocese of Ontario, and instead of crossing the ocean for consecration at the hands of the archbishop of Canterbury was consecrated on Canadian soil by Canadian bishops. From that time the church expanded remarkably, and whereas a little over a century ago there was only bishop and a few scattered clergy for all Canada there are now 28 dioceses with 1,750 clergy, nine church colleges and three church universities; two missionary dioceses in China and Japan, a large body of missionaries in Japan, China, India, Africa, Palestine and South America with native workers, and Christian schools and orphanages and hospitals; over 2,000 churches and Sunday schools; and over $3,500,000 contributed annually for church purposes and missions. The laws of each diocese are under the control of the Synod of the Diocese which as a rule meets annually and is composed of the clergy and lay representatives from each parish and mission. The whole church in Canada is represented in the General Synod which meets once every three years, presided over by the leading archbishop, who is the Primate of the Church of England in Canada. The outstanding features of the progressive life of the Anglican (or Protestant Episcopal) Church in Canada during the past few years, have been the remarkable progress of the missionary life of the church at home and abroad, the stimulation of the Sunday school and educational work by the establishment of the Sunday school commission, the authorization of the new Canadian Church Hymn Book (the Book of Common Praise) as the one book for use in all the churches, and the revision of the Prayer Book as the Canadian Book of Common Prayer approved by the General Synod held in Toronto, September 1915.

The Presbyterian Church in Canada traces its descent to several distinct sources. The attempt made in the 17th century to found Huguenot settlements failed disastrously and few traces remain of their existence. Among the Presbyterian Loyalists who came to Canada at the close of the Revolutionary War there was a goodly number of descendants of Huguenots. In 1749 Protestant colonists were brought into Nova Scotia from England and the Continent, in order to counteract the disaffection of the Acadians. Again in 1755, after the expulsion of the Acadians, many Protestants from Great Britain and older colonies along the Atlantic coast were induced, by the promise of liberty of conscience and of worship, to occupy the vacant lands. Then there was a large influx of immigration from the north of Ireland and from Scotland. Some districts, such as the county of Pictou, were almost exclusively occupied by Scotch Presbyterians. These people naturally clung to the various ecclesiastical bodies into which Scotch Presbyterianism was divided. And accordingly there were Presbyteries constituted with relations to the Kirk of Scotland and the Secession Church in its two subdivisions of Burgher and Anti-Burgher, and also adherents of the Reformed Presbyterians or Covenanters. The great disruption of the Church of Scotland in 1843 extended to the colonies and added to the existing divisions the Free Presbyterian Church. But in 1861 the process of reunion began with the union of the United Secession Church (inclusive of both Burgher and Anti-Burgher) and the Free Church of the Maritime provinces into one synod.

The history of the Presbyterian Church in the Western provinces followed similar lines but with new complications. Soon after the conquest, Presbyterian congregations were organized in the cities of Quebec and Montreal. Among the Loyalists were not a few Presbyterians. But there was scanty provision for their religious needs. Applications for ministers made to the churches in Scotland met with no response for many years. A similar appeal made to the "Associate Reformed Church" in the United States resulted in the incoming of a number of ministers from that country. Other ministers followed from Scotland and Ireland. In 1818 was organized "The Presbytery of the Canadas." In 1831 there was organized a synod in connection with the Church of Scotland. In 1840 the two synods were united into one. But in 1843 the great disruption in Scotland again rent it assunder and two synods resulted, one in connection with the Established Church of Scotland and the other in connection with the Free Church of Scotland. Besides these there were other independent Presbyteries, one at Niagara and the other at Stamford, composed of ministers from the United States, and a third originated by ministers from Scotland and from Nova Scotia, connected with the "United Presbyterian Church." The first two were disbanded and absorbed into the larger bodies. The third, in 1861, united with the Free Church and the combined body received the name of the Canada Presbyterian Church. In 1875 the greater union was consummated by which all the Presbyterian bodies throughout Canada from east to west, were united in one great Canadian Presbyterian Church. This was an epoch making, and epoch-marking event in the history of Canadian Presbyterianism. It unified the life of the church, and became the starting point of its missionary energy both in the Canadian and world-wide field.

Until the greater union was consummated little had been attempted by the Presbyterians in the evangelization of the Northwest. In 1812 and 1816 a large body of Highlanders had settled in the Red River district, but the only ministers they had were those of the Church of England until 1852, when the Rev. John Black, a devoted missionary, organized them into a congregation. Little more was done until after the federation of Canada and the complete union of the Canadian Presbyterians. In 1881 the General Assembly appointed the Rev. Dr. James Robertson to be superintendent of Presbyterian missions in the Northwest. This remarkable man laid the foundations of Presbyterian organization throughout those vast territories and covered the whole country with a network of Presbyterian missions, so that now (1916) in place of one there are eight district superintendents. The Presbyterian Church in Canada is one of the dominating religious forces of the Dominion, and to-day with 1,899 ministers, 3,815 Sabbath schools, 333,457 communicants, eight theological colleges, church property valued at $23,447,000, it stands at the very forefront of the Protestant life of the Dominion. The Presbyterian Church in Canada was the first branch of the church in the world to put social service and evangelism together, having evangelical social settlements and redemption homes from Sydney and Montreal and Toronto to Winnipeg, Calgary and Vancouver.

The Methodist Church in Canada traces its origin to two distinct sources, England and the United States. In 1770 Lieutenant-Governor Franklin sought English settlers for the province of Nova Scotia in the East Riding of Yorkshire. Among them were the earliest Methodists of Canada, one of whom was the noted preacher and evangelist, John Black. In 1784 he went to the United States, and his appeal to the Baltimore conference led to the coming of a number of Methodist ministers to the Maritime provinces. In Quebec the first Methodist preachers were connected with the British regiments. As early as 1778 Methodists from New York State came to the Eastern Townships and to Upper Canada. The Methodists did a noble work in laying the foundation of religious life and worship in many districts in Canada, especially in the province of Ontario, a great impetus being given by the labors of Barbara Heck. Until the War of 1812 Canadian Methodism was closely connected with that of the United States. Negotiations were then entered into with the British Wesleyans. Unhappy dissensions followed. While one party was anxious to maintain the American connection, the other insisted that, as loyal British subjects, they should look to the mother land. A compromise was arrived at by which the American connection was to be observed in Upper Canada, while the British missionaries were to be free to enter Lower Canada, and the Maritime provinces. This compromise was of short duration; for when, in 1828, the American conference relinquished its jurisdiction over the Canadian conference and the latter was independently organized under the name of the Methodist Episcopal Church in Canada, the British conference decided not to confine its work to Lower Canada. After much controversy, in 1833 a union between these two branches of Methodism was consummated under the name of «The Wesleyan Methodist Church in North America.» But, notwithstanding this union the Methodist Episcopal Church survived in a new form and increased very rapidly.

Methodist missionary work had its origin among the Indians of Ontario in 1829, and in the Northwest began about 1840. Its annals abound with noble achievements. There then existed in Canada five principal Methodist bodies. In addition to the two main bodies already mentioned, different branches of British Methodism had been brought into the country, namely, the Methodist New Connection, the Primitive Methodist body and the Bible Christians. All these became firmly rooted in Canada and developed into strong bodies. The need of unification began to be earnestly discussed as early as 1866. In 1873 a union was consummated between the Wesleyan, the New Connection, and the Eastern British-American Conference, but it was not until 1883 that, at a general conference held in Belleville, the union was consummated. Then all the Methodist bodies, hitherto locally or ecclesiastically separated, were brought together; and, from the Atlantic to the Pacific, there is now one great Methodist Church of Canada, with 2,337 ordained ministers, 3,821 churches and 1,639 other preaching places, 376,761 church members, and 3,824 Sunday schools, with 41,929 officers and teachers and 420,210 scholars. There was contributed for all missionary work, through her various boards and funds, $1,170,434; she has invested $7,200,391 in her educational institutions, and her activities seek the evangelism of both the individual and society, and the application of the principles of the gospel of Jesus to all the moral, economic, social and political relations of life.

The Baptist Churches derived their origin from the American Baptists. From 1760 onward there are traces of individual Baptists in different localities in Nova Scotia. In 1820 the first Baptist association was formed for the Maritime provinces. The first Baptist Church in Lower Canada was formed in 1794, and consisted chiefly of Loyalist refugees from Connecticut. In 1795 another was organized in Upper Canada. The first Baptist Church in Montreal was not organized until 1830. The Baptists of Canada to-day (1917) occupy a very strong position. With 885 ordained ministers, 1,335 churches, and a membership of 138,197, they represent a very strong religious force in the life of the Dominion. Their leading educational institutions are the Acadia University and Seminary in Wolfville, Nova Scotia, the Woodstock College in Woodstock, Ont., the Brandon College in Brandon, Manitoba, and chiefly the McMaster University in Toronto. In Sunday school work, missions both home and foreign, and in social service, the Canadian Baptists are always to the fore.

Congregationalism has never found a strong footing in Canada. A few scattered adherents came from New England to Nova Scotia in 1758. In the eastern townships Congregationalism was founded in 1811 by settlers from Massachusetts, and in Ontario some 10 or 12 years later. Nothing was done west of Ontario until 1879, when work was begun in Winnipeg. There are in Canada about 13,000 members, and 100 ministers mostly in Ontario, with a few congregations in Nova Scotia, Quebec and the Northwest.

The Evangelical Lutheran Church in Canada dates from the middle of the 18th century. The first German Lutheran landed at Lunenburg, Nova Scotia, in 1749. The first Lutheran congregation in Upper Canada was founded in 1775. Others came in with German immigration. In 1853 the Canada Conference of the Lutheran Church was founded. The main body of Lutherans is in the district of Ontario near he city of Berlin (in 1916 changed to Kitchener) and in the Northwest where large numbers of Swedes and Norwegians are found. There is an Icelandic branch of the Lutheran Church in the Northwest.

There are a number of small religious bodies in Canada, none of which exercises any appreciable influence upon the religious life of the country; chief among them are The Disciples and The Brethren, The Adventists and Mennonites. There are a few Unitarians and Quakers, and the Russellites, Theosophists and Christian Scientists have increased not a little, especially in the cities. The Salvation Army has acquired a considerable foothold in the larger cities and towns, and has latterly given much of its strength to the development of social work in the towns and cities.

There are four paramount considerations which have profoundly affected the whole religious history and development of the Dominion namely, the relations of the churches to the state and to education, their beneficient and missionary activities, and the problem of church union.

Church and State.— In the 18th century the authorities believed that an Established Church was necessary in order to secure the loyalty of the colonists, and it was, without doubt, the intention of the British government to maintain an Anglican establishment in Upper Canada the counterpart of the Roman Catholic establishment in Lower Canada. In 1791 the Constitutional Act was passed reaffirming the provision of previous legislation which gave the King the right to set apart for the support of the «Protestant clergy» the seventh part of all ungranted Crown lands. This was the origin of the «clergy reserves» (see CANADA — THE CLERGY RESERVES). The ambiguity of the term «Protestant clergy» admitted of a variety of interpretations. The Anglican clergy maintained that they alone were intended by the designation. The few clergy connected with the Established Presbyterian Church of Scotland contended that they had an equal right to it, and their claim was supported by eminent legal authority in England. The Methodists, in general, resisted such an appropriation of the public lands, but the British Wesleyans urged an acceptance of a portion of the "clergy reserves." After years of fruitless ecclesiastical strife, an act was passed by the legislature of Upper Canada, by which the lands were handed over to the municipal corporations of the province for secular purposes, provision being made to satisfy the claims of existing incumbents. In lieu of these claims there was paid over to the Church of England the sum of $1,103,405; to the Church of Scotland, $509,739; to other Presbyterians, $8,962; to the Wesleyan Methodists, $39,074; and to the Roman Catholics in Upper Canada, $83,731. The Anglican Church was thus delivered from what might have been its ruin in Canada, and the people of the province released from a grievous injustice and a source of political discontent and strife. In those days the representatives of the churches of England and Scotland, especially the former, had a certain status accorded to them, denied to other denominations. The Methodists were most unjustly charged with disloyalty, to which their connection, in origin and government, with the United States gave some color of plausibility. Until 1830 the Methodists and other dissenters had no right to hold land for places of worship or for the burial of their dead, nor had the Methodists and their ministers the right to solemnize matrimony, even among their own people. It was only after long and bitter controversy that laws were passed authorizing the various religious bodies to hold land for churches, parsonages and burial grounds, and empowering their ministers to celebrate marriages. At the present time all the leading Christian bodies are in a position of practical equality, and marriages can be performed by members of every church and religious denomination duly ordained, and also by any elder, missionary or evangelist of the so-called Congregation of God and of Christ, the Disciples of Christ, the Brethren or any duly appointed commissioner or staff officer of the Salvation Army. Marriages by a magistrate or justice of the peace are unknown in Canada. No civil official is qualified by any legislative act in Canada to celebrate marriage. It is evident then that there is throughout Canada complete separation of church and state, with the exception of the peculiar position held by the Roman Catholic Church in Quebec, secured by treaty and the terms of British occupancy of that province. Canadians believe in a church-supported state, not in a state-supported church, and with a few exceptions the religious spirit of the Dominion is remarkably free and democratic.

The Church and Education.— So long as France held Canada, education was entirely in the hands of the Roman Catholic Church. The Jesuits, Franciscans and other orders laid the foundations of the colleges and seminaries which hold an important place in the education of Lower Canada. Thus the system of education was entirely ecclesiastical. Under British rule the attempt was made to establish free schools common to the whole population and unsectarian in character. This was found to be impracticable. With the union of the two provinces in 1841 separate schools had to be conceded to the Protestants in Lower Canada because the public school system was essentially Roman Catholic; and when, in the same year, the first attempt at a general system of public schools was made in Upper Canada, the Roman Catholics there secured the concession of separate schools, but in a very limited way. This, for many years, was a subject of controversy, political as well as religious, the Liberal party demanding the abolition of separate schools and the Roman Catholic authorities seeking the complete control of the education of their children. Finally, on confederation in 1867, the separate school system was bound upon the province of Ontario; although, as is noteworthy, there are more Roman Catholic children in the public schools of Ontario than in the separate schools. In the Maritime provinces and in northwestern Canada there are no separate schools.

While public school education has been removed from the control of the churches (except in Quebec) the great body of the people are anxious that it should not be divorced from the sanctions and influences of religion. In the province of Ontario, the public schools are, with few exceptions, opened daily with prayer and the reading of the Scriptures. In not a few, the Bible is carefully taught. But much depends not only upon the character of the teachers, but also upon the disposition of the school trustees, to whom the law gives a large discretion in this matter. There is a strong feeling growing in the community at large and expressed by resolutions of the different church legislatures that there is urgent need of more ethical and Biblical teaching in the schools and that it is possible to secure it upon lines acceptable to the great majority of the people and with proper regard for the conscientious convictions of those who may differ from them.

Sectarian jealousies greatly hindered the development of higher education in all the older provinces. The struggle in Ontario occupied a very large place, both in the politics and the religious life of the province. The attempt to create a national university was for a long time prevented by the exclusive policy of the Anglican authorities, who used public funds for the establishment of King's College in 1843 (the charter was obtained in 1827) upon an exclusively Anglican basis in spite of the desire of the first bishop who desired to have it upon a broader national line. In 1849 King's College became the University of Toronto, upon a broad undenominational basis, but not until the Church of Scotland, shut out from King's College, had established Queen's University, and the Methodists founded Victoria University, which is now federated with the University of Toronto. Other denominational colleges sprang into existence. After the secularization of King's College, Trinity University was established by Bishop Strachan, upon an exclusively Anglican basis. The leaders of the broader policy had been broad-minded Anglican laymen, and it was laymen of the same type who, in 1877, established Wycliffe College, federated with the University of Toronto and upon a distinctively evangelical or Low Church basis, as opposed to the High Church position of Trinity University. The latter has not realized the expectations of its founders, and in 1904, abandoned its position of isolation and connected itself with the University of Toronto as a federated college. The result is that, in Ontario to-day, there are Church of England, Presbyterian, Methodist and Roman Catholic colleges federated with the Provincial University; while, apart from it, there still stand the Presbyterian University of Queen's, the Baptist University of McMaster and several Roman Catholic institutions. In Montreal, McGill is virtually a Protestant university, and has affiliated with it Presbyterian, Methodist, Congregational and Anglican schools of theology, which are themselves affiliated in a measure of theological teaching. In Quebec, Laval University is a Roman Catholic institution and the oldest in Canada. In each of the provinces of Nova Scotia and New Brunswick a university was founded under the name of King's College and sustained by means of land and money from the public treasury, but upon an exclusively Anglican basis. The one in Fredericton was remodeled and became the University of New Brunswick, upon a broad, undenominational basis; the other, in Windsor, Nova Scotia, ceased to receive provincial support but remained an Anglican university and theological college. Dalhousie University, in Halifax, while undenominational, has not the status of a provincial university. The Presbyterians have a theological college in connection with Dalhousie. The Baptists have a university in Acadia, Nova Scotia; and the Methodists a university and theological college in Sackville, New Brunswick.

The Work of the Churches.— The Roman Catholic Church carries on a great variety of charitable work in asylums, houses of refuge and reformatories. In the province of Quebec all the provincial institutions are under Roman Catholic control. In the cities the Protestants have distinct institutions controlled by boards representative of the chief Protestant churches. In Ontario, the Roman Catholics are upon the same footing with Protestants in the provincial institutions. In many cities and towns the former have their own hospitals and reformatories, which receive provincial aid in proportion to the number of patients treated. This plan also prevails in the other provinces to a less extent. In other cases, special provision is made for Roman Catholic religious services in addition to the Protestant services.

The charitable work of the Roman Catholic Church is carried on by the various religious orders, many of which are specially devoted to the relief of the poor, the sick, and the fallen.

The work of home missions within the Dominion in connection with the different churches reaches out to every corner of the land, and to the Indians and Eskimos. Foreign missionary work is prosecuted with great vigor by all denominations. Among other good works of an inter-denominational character may be mentioned the Bible Society, the Religious Tract Society, the Evangelical Alliance, the Young Men's Christian Association, the great Christian movement organized by Mr. Mott among university students, the young people's societies, such as the Christian Endeavor, the Epworth League and the Saint Andrew's Brotherhood, and above all the Laymen's Missionary Movement which has done so much to unify the evangelical forces of the Dominion, and to stimulate the missionary and evangelistic life of all the churches in Canada. The organization of women in the home and foreign missionary work of all the churches and in various other associations has greatly stimulated religious life and work. The reverent observance of the Lord's Day throughout Canada has been a marked feature in its religious life. Church attendance has, on the whole, been well maintained. The laws against Sunday excursions and other violations of the Sabbath rest are effectively enforced. The Lord's Day Alliance has the co-operation of the labor unions as well as of the churches in the protection of the Lord's Day. The Protestant churches in Canada exercise a very strong influence upon legislation, education and the press. While not unaffected by modern controversy, their attitude generally has been, on the whole, conservative, while the general tone is more liberal and less acrimonious than in the past.

Old prejudices are passing away. A noteworthy illustration of this is furnished in the public worship of the Presbyterian Church, one section of which refused to use anything except the metrical version of the Psalms, regarding even the use of the paraphrases as a serious and hurtful innovation. Now all are united in the use of a hymn book which contains hymns of all sections of the Church of Christ. In many cases the worship has become more liturgical even in non-liturgical churches. Old controversies have passed into oblivion. Greater liberty both in action and in thought is found in all communions.

It is more than possible that with this enlargement and liberty, there has been a corresponding diminution in the intensity of the religious spirit and a growing laxity within the churches which many regard with apprehension. Family worship is not observed as it once was, the children are not as familiar with the Scriptures as were their parents, and many things are tolerated in professedly Christian families which would a generation ago have been rigidly excluded. It is a time of unrest and transition. But in the midst of much change, the churches in the main hold firmly to the fundamentals of the Christian faith, and in all are found devoted men and women who earnestly follow after the ideals of truth, purity and righteousness.

Among the Anglicans, while the Oxford or Tractarian movement has exercised considerable influence, especially among the clergy, it has seldom reached the extremes seen in England. The majority of the laity have only been slightly affected by it, and they have continued decidedly Protestant. The Presbyterians have exercised a strong influence upon the national ideals of righteousness, and have set a high standard in the education of the ministry. The Methodists have been leaders in Christian liberality and in benevolent enterprises. The Baptists and Congregationalists have borne consistent testimony to the supremacy of the individual conscience and the independence of the Church from state control. Thus each denomination has contributed essential elements to the general religious well-being of Canada, each has in its own sphere accomplished a good work and manifested distinctive excellence, the value of which is coming, more and more, to be recognized by all.

Church Unity.— The general tendency among the Protestant denominations has been toward the unifying of the Christian churches, and this appears the more remarkable when the present religious condition is compared with that of 100 or even 50 years ago, with its polemics and antagonisms. There has been a breaking down of barriers and a marked diminution of the jealousies and rivalries of the past. The old sectarian spirit has, to a large extent, disappeared and a cordial spirit of good-will has manifested itself even in those bodies which special privileges or exclusive theories had tended to separate from others. This is seen in the increasing co-operation in good works, in the frequent inter-denominational comity and in the general attitude of the churches toward each other. It is remarkably manifested, as we have seen, in the changed attitude of most of the churches in regard to higher education. Federation of denominational colleges in a common state university has been accepted by many who were once strenuously opposed to it, as the best solution of our educational problems. In the three chief Protestant churches of Canada, the Methodist, the Presbyterian and the Anglican (they are named in the order of their numerical strength), which are each now a unit throughout the Dominion, the tendency is toward a still larger union. In 1902 a joint committee of the Presbyterian and Methodist churches met to consider the problem of co-operation, and commended the principles of comity and non-intrusion, until some scheme of organic union was agreed upon. For some years after this the union movement progressed, the Anglicans and Baptists favoring co-operation and fraternal comity, the Presbyterians, Methodists and Congregationalists an organic union of their churches. In 1909–10 the Congregational and Methodist bodies approved of the union scheme by large majorities, the Presbyterian Church referring the basis of union to the presbyteries, 793 of which approved and 476 opposed. The general assembly of the Presbyterian Church in Canada, which met in Winnipeg June 1914, definitely committed their Church to union with the Methodist and Congregational churches by a very large majority. The name of the church formed by the union is to be "The United Church of Canada," with 20 articles of faith as doctrine, and an accepted polity of church government, administration and ecclesiastical laws. There is however a small but powerful minority in the Presbyterian Church opposed to the unity movement, and it is possible that the protest of this opposing section and the existence of various practical difficulties may prevent the consummation of the scheme for some years to come.

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26. ROMAN CATHOLIC CHURCH IN CANADA will be treated in this article under three headings: 1. The Church under the French, from the discovery of Canada until the conquest by England (1534–1763); 2. The Church under the rule of Great Britain, from 1763 until the present day; 3. Present condition.

1. Before 1763.— Catholicism was planted in Canada by France, through whose sailors, Aubert de Dieppe (1508), Verazzano (1522), and especially Jacques Cartier (1534), it was discovered about the beginning of the 16th century. Cartier penetrated the estuary of the Saint Lawrence (10 Aug. 1535), and took possession of the country in the name of King Francis I. While endowing his fatherland with new countries, he proposed also to disseminate therein the Catholic faith, as related in the account of his travels inserted in the 'Histoire de la Nouvelle France' by Marc Lescarbot (Paris 1609).

From Cartier to Champlain (1542–1608) a few attempts at colonial settlement in Acadia were succeeded by the foundation of Port Royal (now Annapolis, N. S.). There appeared the first missionaries, Jesuits and secular priests. Champlain visited Canada in 1603, and in 1608 founded the town of Quebec and settled there. In 1615 he invited Recollet Fathers from France, who became the first apostles to the Indians, and inaugurated those missions in the interior of Canada so famous during the 17th century, and in which the Jesuits (1625) and the Sulpicians (1657) soon took such a glorious part.

Two distinct and savage races, the Algonquins and the Huron-Iroquois, inhabited the countries just opening up to missionary zeal. To the Algonquin race belonged the Abenakis, the Montagnais, the Attikamègues or Poissons-Blancs, the Otawawas, and several other tribes scattered from Hudson Bay to the western prairies. From the Huron-Iroquois source sprang two great branches: the Yendats or Hurons established between Lakes Huron, Erie, Saint Claire and Simcoe, and the Iroquois who dwelt south of Lake Ontario, and were divided into five nations: Mohawks, Onondagas, Senekas, Oneidas and Caiyoquos. It would appear that the total population of these tribes was not above 100,000 individuals.

The Recollets were the first to devote themselves to evangelization among the Indians. Father d'Olbeau instructed the Montagnais; Father Le Caron penetrated deeply into the land of the Hurons to carry them the true faith, while several fathers remained at Quebec preaching among the colonists and the surrounding savages. During 10 years they multiplied their travels, their preachings, opened schools for Indian children, called to their assistance new recruits, and among them Father Viel, who perished in the Ottawa River, victim of the perfidy of a Huron. Consult Sagard, F., 'Histoire du Canada' (Paris 1686); Beaubien, Ch., 'Histoire du Sault-au-Récollet' (Montreal 1897). Unable to fill the wants of the missions alone, the Recollets called upon the Jesuits (1625), and on their invitation Fathers Brebeuf and Lalemant with other missionaries came to Canada. Their efforts for the conversion of the savages were not attended with the success hoped for, owing to the opposition of the Company of Merchants, to whom the French King had conceded the monopoly of traffic in these regions, on the condition of founding a colony. Louis XIII and Richelieu replaced them (1627) by the Company of New France who engaged to lead "the people inhabiting Canada to the knowledge of God, and to instruct them in the Catholic, Apostolic and Roman religion." There was no time to see the effects of these good intentions, for less than two years later

(1629), Quebec and the colony fell into the power of David Kerth, who fought on the side of England. The missionaries and their helpers were obliged to return to France.

When Canada was returned to France by the Treaty of Saint German-en-Laye (1632), the Jesuits at the request of Cardinal de Richelieu again took up their missions. Father Lejeune organized religious service at Quebec and opened the college of that town (1635), then he plunged into the interior in search of the wandering tribes of Montagnais. Others established a mission at Miscou, and from there branched forth into the peninsula of Gaspé, into Acadia and Cape Breton. Trois Rivières and Tadousac on the banks of the Saint Lawrence became centres of evangelization. Consult ‘Les Jésuites et La Nouvelle France au XVIIe siècle,’ par le Père de la Rochemontaix, S. J. (Paris 1895).

Meanwhile hospital religious and Ursulines arrived at Quebec (1639), the first to direct a Hôtel-Dieu endowed by the Duchess of Aiguillon, niece of Richelieu; the second at the head of whom was Marie de l'Incarnation, to provide for the education of the girls. These heroic women were rivals in zeal for the conversion of the savages. Consult Abbé Casgrain, ‘Histoire de l'Hôtel-Dieu de Québec’ (Quebec 1878); id., ‘Histoire de la Vénérable Marie de l'Incarnation’ (Quebec 1880); ‘Lettres de Mère Marie de l'Incarnation’ (Paris 1681).

About this time the Company of Montreal was formed. Its originators were two men of God, M. Olier, founder of the Seminary of Saint Sulpice, and M. de la Dauversière, a pious laic. Its sole aim was the “glory of God and the establishment of religion in New France without charge to the clergy or to the people.” Encouraged by Urban VIII, it found in Paul Chomedey de Maisonneuve a faithful executor of its intentions. This illustrious man landed on the island of Montreal which the Society had acquired, 18 May 1642, and laid the foundations of Villemairie, now Montreal. With him came Mlle. Mance, foundress of the Hôtel-Dieu, and they were soon joined by Marguerite Bourgeoys, an energetic and saintly woman, who organized the religious of the Congregation of Our Lady (1653) for the education of Canadian girls. In 1657, Mr. Olier, when dying, sent to the colony the first four Sulpicians: de Queylus, Souart, Gallinier and d'Allet. Consult Dollier de Casson, S. S., ‘Histoire du Montréal,’ published by the Historical Society of Montreal (1869); Faillon, S. S., ‘Histoire de la colonie française en Canada’ (Montreal 1865); id., ‘Vie de la Vénérable Mère Bourgeoys’; ‘Vie de Mlle. Mance’ (Paris 1854); id., ‘Vie de M. Olier, founder of the Seminary of Saint Sulpice’ (3 vols., Paris 1873); P. Rousseau, S. S., ‘Vie de Paul Chomedey de Maisonneuve’ (Montreal 1886).

The hour of martyrdom sounded for the Jesuits. After escaping twice from the ferocious Mohawks, Father Jogues died beneath their blows (1646). Two years later (1648), the flourishing mission among the Hurons was completely destroyed by the Iroquois, and five Jesuits, Fathers de Brebeuf, Daniel, Lalemant, Garnier and Chabanel, were overwhelmed in the massacre of their neophytes. Father Buteux also fell a victim to the Iroquois when going to the Attikamèques (1652), and Father Bressani escaped with difficulty from these barbarians. Consult Charlevoix, ‘Histoire et Description générale de la Nouvelle France’ (Paris 1744); ‘Rélation des Jésuites’ (Quebec 1858); these two works with the ‘Relations inédites de la Nouvelle France’ (1672–1779), and other documents have been collected and published with an English translation in the edition of Reuben Thwaites, Cleveland, 1897, under the title: ‘Travels and Explorations of the Jesuit missionaries in New France’ (1610–1791); Parkman, ‘The French pioneers in North America.’ These attacks of the Iroquois became the terror of the colony. Montreal owed its salvation only to the bravery of Maisonneuve and to the heroic devotion of young Dollard, who at the head of 16 companions for several days faced over 700 Iroquois, and resisted them to the death.

The year 1659 marks the commencement of the ecclesiastical hierarchy in Canada. Monsignor François de Montmorency-Laval was named bishop of Petrea and apostolic vicar of New France by Alexander VII. The prelate had numerous difficulties with the governors d'Avangour and de Mésy (1663–65) over the traffic in brandy which was causing ruin among the Indians. He opened a small seminary for the training of future clerks, and 10 years later (1678) laid the foundations of a large seminary for preparation for the priesthood. In 1674 Quebec was created a bishopric by Clement X; the jurisdiction of the new see extended over all North America until 1789, the year in which the bishopric of Baltimore was created. To Monsignor Laval are also due the creation of charges with resident priests, the incorporation of the Seminary of Quebec and its union with the Seminary of Foreign Missions at Paris, the creation of a chapter of canons; in one word a good diocesan organization. He came in conflict with Governor Frontenac and Intendant Talon to maintain the rights of the Church and to extirpate the abuse of the liquor traffic.

Under his episcopacy the missionaries continued their work. The Sulpicians saw two of their number fall beneath the blows of the Iroquois at Villemarie (1663). Shortly after Messieurs Trouvé and de Salignac-Fénelon, brother of the illustrious archbishop of Cambrai, founded the mission of Kenté (1668), at the point on Lake Ontario where debouches the Saint Lawrence. During 14 years it was a centre whence the true faith radiated throughout all the surrounding region as far as Niagara. The following year (1669) Messieurs Dollier de Casson and Bréhan de Gallinée, Sulpicians, left Villemarie in the company of Cavalier de La Salle with the resolution of advancing west to the Mississippi. Abandoned by the discoverer they traversed alone the region of the Great Lakes, and returned to Montreal after one year of exploration and research; there M. de Gallinée prepared a relation and made a map of the expedition. We should mention also the Sulpician missions of la Montagne, Gentilly, l'Ile-aux-Tourtes and Lac-des-Deux-Montagnes, all in the environs of Montreal. The Jesuits on their side prosecuted arduously their missions. Father Menard evangelized the Outaouais, Father Allouez penetrated as far as Lake Superior (1665) and Fathers d'Ablon and Marquette planted the cross at Sault Sainte Marie. Other Jesuits joining the explorers Saint-Lusson and de La Salle, took possession of the banks of Lake Huron; and two years after (1670) Father Albanel penetrated, while traveling by the Saguenay, as far as Hudson Bay. The missions to the Iroquois were resumed, but without great success. In 1669 the sedentary mission of the Prairie de la Madeleine was founded to the south of Montreal. There expanded the lily of Canada, that Catherine Tegakonita, who died in her 23d year, and for whom the III Council of Baltimore has asked the process of canonization. This mission transferred to Sault-Saint-Louis, now Caughnawaga, is still flourishing (having over 2,000 members), and after numerous vicissitudes has again come into the hands of the Jesuits. From Canada also went Joliet and Father Marquette on their discovery of the Mississippi (1673). Consult 'Récit des voyages et découvertes du Père Marquette' (New York 1855); Thwaites, Reuben Gold, 'Father Marquette' (New York 1902).

Recalled to Canada by Talon, the Recollet Fathers (1670) established themselves at Quebec and had four missions: Trois-Rivières, l'ile Percée (Gaspé), Saint-John River and Fort Frontenac on Lake Ontario. In 1682, Mr. Dollier de Casson called them to Montreal, and in 1692 the missions of Cape Breton and of Plaisance in Newfoundland were confided to them.

Meanwhile Monsignor Laval, worn out with his administration, gave in his resignation to Louis XIV (1684). After four years' sojourn in France, he returned to Quebec (1688), where he lived in profound retirement until his death in 1708. The episcopacy of Monsignor Laval marks one of the most prosperous epochs of the Canadian Church and of the colony. Between 1665 and 1680, thanks to the intelligent activity of Colbert and de Talon, more colonists came to Canada than in the preceding half century. A strict supervision was exercised in the choice of the young women sent, as much as regarded their physical as their moral qualities. Several whose loose manners might have become a cause of corruption and decadence rather than of growth were rejected. Consult Gailly de Taurines, 'La nation canadienne' (Paris 1894); Ferland, 'Cours d'histoire du Canada'; Verreau, 'Des Commencements de l'Eglise du Canada — Archives Societé Royale' (Mai 1884); 'Souvenir des fêtes du 2^{me} centenaire de François de Laval' (Quebec 1908); Gosselin, 'Evêques de Quebec.'

Monsignor de Saint-Vallier succeeded Monsignor Laval. The new bishop founded the general hospital of Quebec, endowed it with his own contributions, built the episcopal palace, published a catechism for the diocese, established ecclesiastical conferences and held the first synods. In 1690, the American Phipps, having attacked Quebec with 32 vessels the prelate in a pastoral letter exhorted the Canadians to bravely do their duty. When after useless efforts the enemy had departed the bishop dedicated to Our Lady of Victory the church in the Lower Town, still standing, as a monument to Heaven's protection.

The era of great missions passed; nevertheless Cadillac and a missionary founded the town and colony of Detroit (1700); the priests of the Seminary of Quebec became the apostles of the Tamarois, between the Illinois and the Ohio rivers; the Jesuits evangelized the Miamis, the Sioux, the Otawawas, the Illinois and held their ground amid the Iroquois. With the opening of the 18th century, commenced the furious and repeated assaults of England and its American colonies against the little Catholic colony, in which the French government, careless of the future, became less and less interested. The emigration to New France ceased toward the end of the preceding century. No more were to be seen the great convoys setting sail for America crowded with new populations full of faith and energy. In 1713 the French Canadian population was 18,000, and in 1739 scarcely reached 42,000. It was a small number to resist an adversary which counted in 1706 260,000 individuals, and which was increasing each year.

Acadia especially was weak, having but 2,000 inhabitants of French origin. The first attacks were directed against her. After having resisted in 1704 and in 1707, she fell (1710) into the power of the English colonists, and three years later, the Treaty of Utrecht (q.v.) (1713) ceded Acadia, Newfoundland and Hudson Bay to England. From this epoch to that of the violent dispersal of the Acadians by Lawrence (1755), the Catholics found devoted support in the Sulpicians and the priests of the Seminary of Quebec who were their missionaries. The names of Geoffroy, Baudoin, Trouvé, de Breslay, Metivier, de la Goudalie, de Miniac, Chauvreuse and Desenclaves, of Saint-Sulpice; of Petit, Thury, Gaulin, of the Seminary of Quebec, deserve to be remembered by posterity. Mention should also be made of Father Rasles, S. J., missionary to the Abenakis, who was killed by the English. We will not recall here the incredible atrocities which have relegated Lawrence's memory to the execration of humanity, and which Longfellow has immortalized in his touching poem 'Evangeline.' Consult Richard, 'Acadia, Missing Links of a Lost Chapter of American History' (Montreal 1895); Abbé Casgrain, 'Les Sulpiciens en Acadie' (Quebec 1897); id., 'Un pélérinage au pays d'Evangeline' (Quebec 1885).

These painful events only too plainly foreshadowed the fate awaiting the Canadian colony. Instead of sending men, France persisted in raising at great expense useless fortifications at Louisburg and at Quebec. Canada was to fall through lack of foresight.

The episcopacy of Monsignor de Saint-Vallier lasted until 1727. The endowments with which he enriched the various religious establishments of the country have been estimated at £600,000. His successor, Monsignor Duplessis-Mornay, never came to Canada. He governed his diocese by an administrator. Resigning in 1734, he was replaced by Monsignor Dosquet who devoted himself to promoting the education of youth and the religious life in the communities. Monsignor de Lauberivière, who succeeded him, died a month after his arrival in his diocese, victim of his charity in attending soldiers attacked with scurvy (1740). His successor was Monsignor de Pontbriand (1741-60), the last bishop under the French régime. He built a cathedral, restored the Ursuline monastery at Trois-Rivières and the Hôtel-Dieu of Quebec, which had been destroyed by fire, established ecclesiastical retreats, and by his science and virtue was the model of his clergy.

Among eminent priests of this epoch should be mentioned M. de Belmont, superior of Saint-Sulpice at Montreal (1701–32), who covered the region with his liberalities and his works; M. Normant du Faradon, his successor (1732–59), who with the Venerable Mother d'Youville shares the glory of having founded the admirable charitable institution of the Grey Sisters. Consult Faillon, S. S., 'Vie de la Vénérable Mère d'Youville' (Montreal 1852). To Saint-Sulpice belonged also that abbé Picquet to whom the town of Ogdensburg erected (1899) a monument, as well as to its founder. Consult 'Lettres édifiantes et curieuses' (Lyon 1819); 'Mémoire sur la vie de M. Picquet' by M. de la Lande, of the Acadamy of Sciences, p. 262; 'Biographie universelle ancienne et moderne' (Paris 1823, Vol. XXXIV, p. 289); 'Revue canadienne, janvier et fevrier 1870,' Vol. VII; 'l'abbé Picquet,' by J. Tassé.

The events which precipitated the fall of Canada are well known. Quebec was taken (1759), but the bishop, Monsignor de Pontbriand, died at Montreal (1760) without seeing that town in the hands of the English. M. Briand undertook the administration of the region of Quebec; M. de Montgolfier, Sulpician, of that of Montreal. The Treaty of Paris which ceded Canada to England was signed 10 Feb. 1763. The period of establishment closed for the Canadian Church, and that of conflicts and of progress opened.

2. After 1763.— All the natural chiefs of the Canadians recrossed the ocean with the French flag. A population of 70,000 souls was abandoned without a guide. The clergy alone remained, invested with the double mission to preserve the ancestral faith and direct the people in the attainment of their civil and political rights. They understood their mission and it can be truthfully said that they did not fail therein.

The Treaty of Paris, it is true, guaranteed the Canadians «the free exercise of their religion,» but with the addition «so much as the laws of Great Britain will permit.» This restriction left a great latitude in the interpretation of the treaty. In fact it was a species of persecution. The government of London thought to substitute the Anglican hierarchy and religion for the Catholic hierarchy and religion and flattered itself in easily overcoming the conscience of a handful of colonials. The French laws were abolished and the oath of allegiance exacted from all Canadians. They notified the priests that they would have to subscribe to it or prepare to leave Canada. It was a demand to abjure and rebel against the authority of the Roman See. At the same time they prepared a list of the churches, the priests, their charges, their revenues, their property, also one of the religious communities with their constitutions, rights, privileges and properties. In addition George III encouraged the governors to found Protestant schools so that the Church of England could be established in principle and in practice, and the inhabitants gradually be brought to embrace the Protestant religion, and their children educated in the principles of that religion.

The communities of men were also condemned to die out. Recollets, Jesuits and Sulpicians were prohibited from recruiting in the country or from receiving members from abroad. They took possession of the properties of the first, and as to the Sulphicians, they were reduced from 30 which they were in 1760, to two septuagenarians, whose deaths they awaited to take possession of their effects, when the French Revolution broke out. The English government then relaxed its rigorous attitude and offered the victims of the furious revolutionists an hospitality which does them honor. The people though were not better treated. For them there were no public positions, no place in the councils of the colony. A species of ostracism followed them everywhere. In the midst of these painful conjunctions the Catholics did not despair; they sent to London petition upon petition claiming on the faith of the treaties the preservation of their religion, their priests, their language and their civil rights. At last in 1766, George III consented to the consecration of Monsignor Briand, as bishop of Quebec, without recognizing any other title, however, than that of superintendent of the Catholic cult.

Meanwhile a storm was arising in the Anglo-American colonies. The metropolis understood that it should conciliate the Canadians. The Act of Quebec (1774) restored the French civil laws, dispensed with the test-oath and recognized their civil and political rights. During the war which followed and which terminated with the death of Montgomery (1775) under the walls of Quebec, the Canadian people, docile to the voice of their clergy, remained faithful to the sovereign which Providence had given them.

During these years the Catholic population had grown: in 1784, it numbered 130,000 French-Canadians; the Maritime provinces were being peopled by Irish and Scotch Catholics, and the Acadians, dispersed in 1755, were grouping silently and multiplying, supported by such apostles as the abbés, Desjardins, Sigogne, de Calonne and Ciquart, Sulpician. «To these confessors of the faith the Acadian race owed its organization; these were the true founders of its nationality.» Consult 'Vie de l'abbé de Calonne' (Trois-Rievières 1892); Casgrain, 'Pélerinage au pays d'Evangéline.'

After having courageously combated, Monsignor Briand resigned in 1784. His successor, Monsignor d'Esglis, was an old man of 75 years. He speedily took a coadjutor in the person of Monsignor François Hubert, who became titular bishop in 1788. In a remarkable memoir to the Holy See (1794), the prelate states that his diocese contained 160,000 Catholics; that the efforts of the Anglicans to win the Canadians to their religion were in vain; that his diocese is too vast for him to administer conveniently. But, he added «every plan of division would find insurmountable obstacles on the part of Great Britain which is occupied on the other side in the means to establish in this country a Protestant clergy.» Consult 'Mandements des évêques de Québec,' Vol. XI, p. 474.

Monsignor Denaut (1797–1806) succeeded Monsignor Hubert. Under his episcopacy the fight against Anglicanism is summed up in the Royal Institution. Thus was named a cleverly composed organization designed to monopolize instruction of every degree by concentrating the power in the hands of the governor. The Anglican Bishop Mountain was chosen as president of the institution. Profiting by a legal restriction the Catholics prevented its success. Consult Pagnuelo, S., 'Études historiques et légales sur la liberté religieuse en Canada' (Montreal 1872).

From 1806 to 1825 the Episcopal See of Quebec was occupied by Monsignor Octave Plessis, a prelate distinguished as much by the breadth of his intelligence and the force of his character, as by his courtesy in all proceedings. He had to hold his own against a powerful oligarchy which would not recoil from extreme measures, and which was resolved to make the Church the vassal of the civil power, the slave of the government; in fact to lead insensibly Canada to Anglicanism by the governmental channel. The soul of this plan was a certain Witzius Ryland, secretary of the governors of Canada from 1790 to 1812. It would take too long to enter into the details of this struggle, into which Sir James Craig was weak enough to enter; it suffices to say that Monsignor Plessis by his individuality embodied Canadian resistance without ever wounding English sentiment; that he obtained for himself official recognition of his title, bishop of Quebec (1818); that he removed the pretensions of the government to nominate rectors; that he ensured the independence of the Church against the State; and that he inspired his adversaries, even, with respect and admiration for his great character. Faithful besides to the Crown of England, his was the act of a loyal subject in calling to arms his diocesans, on the occasion of the invasion of the United States in 1812. Well and justly could Lord Bathurst reply to the Anglican bishop of Quebec, J. Mountain, who protested again the favors accorded Monsignor Plessis by the London government. "It is not when Canadians are fighting for England that such questions should be agitated." Consult Pagnuelo, 'Etudes sur la liberté religieuse en Canada,' c. IX–XI, p. 86–120; 'Le Correspondant,' April 1877; 'La France Canadienne,' by J. Guérard; Garneau, 'Histoire du Canada,' t. III, 1 XIII, c. 11 and 1 XIV, c. I; 'Mandements des évêques de Québec,' t. III; 'Conversation entre Sir J. Craig et Mgr. Plessis,' p. 59; 'Mémoire au gouverneur,' p. 79; French, 'Biographical notice of J. O. Plessis, Bishop of Quebec' (Quebec 1864); L. O. David, 'Biographies et portraits' (Montreal 1876, p. 80); Bédard, 'Histoire de Cinquante ans' (1791–1841), (Quebec 1869, c. IV et V).

Monsignor Plessis understood the necessity for dividing his vast diocese so that it might be efficiently administered. Already in 1817 New Scotland was detached with Monsignor E. Burke as apostolic-vicar. This did not suffice. Soon the apostolic-vicarates were created of Upper Canada with Monsignor MacDonell as titular; of New Brunswick and Prince Edward's Island, with Monsignor MacEachern; of the Northwest with Monsignor Provencher; of the district of Montreal with Monsignor Lartigue, Sulpician (1820). These divisions were completed after the death of Monsignor Plessis, by the creation of the sees of Kingston (1826); Charlottetown (1829); and of Montreal (1836).

In the course of years the number of French-Canadians kept on increasing. In 1831 it attained 380,000. In less than 50 years, it had increased by nearly 280,000 souls. This progress was not of a nature to reassure the intolerant and exclusive set which existed on the side of the Anglo-Protestants. Already, about 1820, they had tried to abolish the constitution of 1791, which assured an independent existence to the province of Quebec, and wished to unite Upper and Lower Canada, with the scarcely veiled object of outnumbering the French Catholic population. This plan had failed, thanks to the firmness of Bishop Plessis and his clergy, who, rallying the forces of the country, victoriously opposed Protestantism. Unfortunately, after the death of the bishop, several influential members of the legislative body deserting the sure ground of legal resistance, slipped upon the slope of revolution, fanned the spirit of revolt by their indignant philippics, and provoked the troubles of 1837–38, when several hundred countrymen, led astray by their representatives, flew to arms. Nevertheless, let us say that the voice of the Catholic clergy was sufficiently powerful to keep the mass of the population in the path of duty. The result of this insurrectional movement was the union of the two Canadas. The Act of Union was passed by the Britannic Parliament 23 July 1840.

Before this act of despotism (consult Turcotte, 'Le Canada sous l'Union,' p. 60), which marks an important date in the history of Canada, several works had been created, several deeds accomplished which interest the Church. The seats of education had multiplied: the College of Montreal (1767) founded by M. Curatteau, priest of Saint-Sulpice, and then (1806–28) so prosperous under the direction of M. Roques; the colleges of Nicolet (1804), of Saint-Hyacinthe (1811), of Sainte-Thérèse (1825), of l'Assomption (1832), of Sainte-Anne de la Pocatière (1827). Mention should be made also of the formation of the Société d'éducation of Quebec, to promote primary instruction, and the acceptance of "Fabriques" Schools Law (1824), so favorable toward the same end. To this same period belongs the acknowledgment of the properties of the Seminary of Saint-Sulpice at Montreal by the government of Queen Victoria (1839). This act of justice allowed this venerable institution to follow the course of its charities and to cover the Montreal region with its intelligent liberalities.

To Monsignor Panet, who had replaced Monsignor Plessis (1825–32), succeeded Monsignor Signay. His episcopacy was marked by many misfortunes: cholera (1832), civil war (1837–38), two fires in Quebec (1845), typhus brought by the Irish driven from their country (1847). The 15 years which followed 1840 were more fruitful for the Canadian Church. Five communities of men, and 15 of women dedicated to the ministry, to teaching or to charity, came from France to settle in Canada. The Oblate Fathers of the Immaculate Mary (1841), the Jesuits (1842), the clerks of Saint-Viateur, the Congregation of Sainte-Croix (1847), and the

Brothers of the Christian schools answered to the call of Monsignor Ignace Bourget, bishop of Montreal (1840–79). Then were founded the Sisters of Providence (1843), of the Holy Names of Jesus and Mary (1843), of Mercy (1848), of Saint Anne (1849). At the same time the Episcopal Sees were multiplied: Toronto with Monsignor de Charbonnel, S. S. (1842); Saint John, N. B. (1842). Quebec elevated to the dignity of an archbishopric received as suffragan sees Montreal, Kingston and Toronto. The same year (1844) the bishopric of Arichat, N. S., transferred to Antigonish since 1886, was created: in 1847 the see of Bytown or Ottawa and of Saint John, Newfoundland. United in council at Quebec (1851), the bishops decided on the foundation of Laval University and asked the Holy See to establish the sees of Trois Rivières and Saint Hyacinthe (1852). Let us mention also the foundation of societies for colonization, for temperance, of Saint-Vincent de Paul and of an educational system for separate schools for Catholics.

Meanwhile the Catholic population had increased considerably. In the province of Quebec it more than doubled in 30 years; in 1831 it counted 425,000, in 1861, 942,800 souls; in Ontario it attained 260,000. This development demanded the multiplication of primary schools. This was the work of J. B. Meilleur, of whom it can be said, «he undertook the direction of Public Instruction from its cradle; that he had to create everything even to the love of instruction among the people.» Consult Meilleur, J. B., 'Mémorial sur l'éducation au Bas-Canada' (Quebec 1876). The Catholic colleges were opened of Joliette (1846), of Rigaud (1850), of Saint-Lawrence (1847), of Saint Mary of Monnoir and Levis (1853). That same year (1853), the Seminary of Quebec undertook the heavy but glorious task to build Laval University which was inaugurated in the presence of Lord Elgin, 14 Sept. 1854, and which since has rendered such immense services to the Catholic cause and to the country. Consult Roy, C., 'L'Université Laval et les fêtes du Cinquantenaire' (Quebec 1903).

While these works were being accomplished in the East, the West was opening to evangelization. With Monsignor Provencher, the first apostles of these districts had penetrated along the Red River. Wishing to ensure the future of these missions, the bishop of Sainte-Boniface called to his assistance the Oblate Fathers and even chose from them Father Taché as coadjutor. Monsignor Provencher died in 1853 and was succeeded by Monsignor Taché. He had to expend his intelligence and his strength during 40 years (1853–94). It does not enter into the limited scope of this essay to recount the works of the Oblates in the Far West, although they constitute one of the most remarkable chapters of the Catholic missions. The apostolic-vicarates and the Episcopal sees embrace in their jurisdiction every point in these distant regions which came under the indefatigable zeal of these missionaries. Consult Dugas, G., 'Monsigneur Provencher et les Missions de la Rivière-Rouge' (Montreal 1889); Piolet, S. J., 'Les missions Catholiques françaises' (Paris 1902); Monsignor Taché, 'Vingt années de missions dans le Nord-Ouest de l'Amérique' (Montreal 1869); Don Benoît, 'Vie de Monsigneur Taché' (Saint Boniface 1904); Père Jonquet, O. M. I., 'Vie de Monsigneur Grandin (Montreal 1904); Cooke, R., O. M. I., 'Sketches of the Life of Monsignor de Mazenod' (London 1879); 'Dictionnaire des Canadiens de l'Ouest,' par Rev. P. Morice (Quebec 1908); 'Histoire de l'Eglise Catholique dans l'Ouest Canadien,' 1659–1905 par Rev. P. Morice (Montreal 1912).

The years which followed 1860 were full of solicitude for the Catholic clergy. The councils of Quebec show us the bishops preoccupied with the progress of impiety, with evil books, with the weakening of the faith, and painfully affected by the events which led to the invasion of the pontifical domains by the armies of Victor Emmanuel. The Canadians flew to arms and several detachments of zouaves offered their services to Pope Pius IX (1868).

The Catholic heirarchy had developed in the course of years. In 1852, Halifax was created an archbishopric with Charlottetown, Saint John, N. B., Arichat, N. S., and soon after Chatham, N. B. (1860), as suffragan sees. The year 1871 marked the creation of the ecclesiastical province of Saint Boniface (Manitoba), with the bishopric of Saint Albert (1871), and the apostolic-vicarates of Athabasca-Mackenzie and of Saskatchewan for suffragans. In the preceding year (1870) Upper Canada was created an ecclesiastical province with Toronto for archbishopric and Kingston and Hamilton for suffragans. Since then Kingston has become an archiepiscopal see (1878) with two suffragans: Peterboro (1882) and Alexandria (1890). In the province of Quebec, Sherbrooke (1874), Chicoutimi (1878), Nicolet (1885) became bishoprics. In 1886, Montreal was created an archbishopric under Monsignor Fabre, with Saint Hyacinthe and Sherbrooke as suffragans, to which have since been added Valleyfield (1893), and Joliette (1904). The same year Leo XIII created the ecclesiastical province of Ottawa, which received as suffragan the Episcopal See of Pembroke (1898). To crown this flourishing hierarchy, Leo XIII honored with the cardinal purple Monsignor Taschereau, archbishop of Quebec (1886). To conclude the study of the second half of the 19th century, mention must be made of three particular points: (*a*) The Awakening of the Acadian Race, which had expanded imperceptibly.— From the 25,000 that they were in 1815, the Acadians increased to the number of 80,000 (1864), and 125,000 (1899). To Father Lefebvre, a Canadian priest, is due the merit of having amalgamated them and, in founding the college of Memramcook, N. B., of having contributed powerfully to render them a force for Catholicism in the Maritime provinces. Today the Catholics of French origin in that region amount to 155,000. Consult P. Poirier, 'Le Père Lefebvre et l'Acadie' (Montreal 1898). (*b*) The Schools of New Brunswick and of Manitoba.— In 1867 when the Canadian Confederation was founded, the educational system of New Brunswick allowed the Catholics of that province to have separate schools. This right was refused them in 1871, the aim being to compel them to send their children to the public schools, that is to say, Protestant schools. An organized resistance spread everywhere and to avoid a sanguinary conflict a compromise was effected. The unjust law was not abrogated but the concessions were of such a nature that peace was re-established (1874).

An injustice of the same kind wronged the Manitoban Catholics in 1890. Despite the vigorous fight led by Monsignor Langevin, successor to Monsignor Taché in the see of Saint Boniface, the iniquity was not amended, but a compromise was arranged between the Laurier government and the Holy See, which for want of a better softened without destroying the disastrous effects of the law. This question which so impassioned the minds in 1896 gave rise to the creation of the Apostolic Delegation to Canada. (*c*) The foundation of Laval University at Montreal.— For a long time Montreal was in want of a Catholic university. Monsignor Bourget applied to the Propaganda. Not to injure the rights of Quebec, a branch in Montreal was granted by the pontifical bull *Inter varias sollicitudines* (1876). The powers and the autonomy of this branch were signally increased by Leo XIII (1889). In need of the necessary buildings, the liberality of the Seminary of Saint Sulpice, governed then by M. Colin, filled this void. Laval University at Montreal now has spacious premises and numerous professorships.

3. **Present Condition.**— (*a*) *Ecclesiastical provinces.*— The total Canadian population in Canada is estimated at 2,230,008 by the census of 1901. Since then it has increased about 100,000 through immigration. With 1,430,000 Catholics, the province of Quebec alone comprises three-fifths of the faithful followers of Rome in Canada. Nearly 900,000 are scattered throughout the other provinces. Everywhere, except in Ontario, in Manitoba and in British Columbia, Catholicism exceeds in the number of its adherents any of the separate Protestant sects. It embraces 42 per cent of the total population of the Dominion, which is 5,371,315. From 1890 to 1900 the Catholics increased by over 250,000 souls. This gain was effected despite a very pronounced emigration movement of French Canadians to the Northeast of the United States. The following table gives at a glance the ecclesiastical divisions of the Dominion of Canada:

ARCHBISHOPRICS SUFFRAGAN BISHOPRICS	Titulars in 1916	Catholics	Priests	Churches and Chapels
QUEBEC	Card. L. N. Begin Auxil. P. E. Roy	380,000	679	286
Trois-Rivières	F. X. Cloutier	95,884	143	76
Rimouski	A. A. Blais	135,628	158	124
Chicoutimi	T. Gabreeque	81,000	136	68
Nicolet	H. Bruneault	90,000	163	68
Préf. Apost. du Bas St Laurent	G. Blanche	9,650	19	39
MONTREAL	P. Bruchési G. Gauthier, aux.	545,406	824	263
Saint Hyacinthe	X. Bernard	116,000	250	120
Sherbrooke	P. Larocque H. Chalifoux, aux.	95,000	148	86
Valleyfield	M. Emard	56,363	104	44
Joliette	G. Forbes	65,000	127	53
OTTAWA	H. Gauthier	138,000	310	141
Pembroke	P. Ryan, admr.	38,500	49	71
Mont-Laurier	F. X. Brunet	34,500	58	46
Haileybury	E. Latuliffe	25,000	51	38
TORONTO	N. Mac Neil	75,000	140	108
Hamilton	T. Dowling	62,000	70	60
London	M. Fallon	65,000	106	84
KINGSTON	M. J. Spratt	43,000	57	75
Peterboro	M. O'Brien	27,000	31	52
Alexandria	W. MacDonell	25,500	20	25
Sault Sainte-Marie	D. Scollard	40,000	60	91
HALIFAX	E. McCarthy	55,000	74	86
Charlottetown	H. O'Leary	50,000	54	51
Saint Jean, N. B.	A. Leblanc	61,385	80	100
Antigonish	J. Morrison	87,000	108	108
Chatham	J. Barry L. O'Leary, aux.	80,000	114	80
SAINT BONIFACE, including the new archd. of Winnipeg, the limits of which are not yet known				
Saint Boniface Winnipeg	A. Béléveau A. Sinnott	62,454	181	181
Vicariate of Keewatin	O. Charlebois	10,500	16	
EDMONTON	E. Legal	38,000	105	98
Calgary	J. McNally	29,000	37	51
Athabaska (Vic.)	E. Grouard C. Joussard, aux.	....	27	19
Mackenzie	G. Breynat	....	23	22
REGINA	E. Mathieu	57,900	106	117
Prince Albert	A. Pascal	35,000	73	129
VANCOUVER	T. Casey	38,000	57	60
Victoria	A. MacDonald	10,000	19	24
Yukon	P. Bunöz	....	10	12

The Catholics number about 2,873,700, for the whole Dominion, the province of Quebec having about 1,766,000. The other eight provinces have about 1,107,700. It is to be remarked also that of the 1,107,700 Catholics disseminated throughout the eight provinces, a little over one-third (400,000) are Catholics of French descent.

On the death of a bishop, the bishops of the province send a list of three names to Rome and the Pope chooses and names a successor. The bishop-designate cannot be consecrated before receiving his bull from the Holy See. He enters immediately on his functions without having to fulfill any civil formality, and the diocesans render their homage and obedience as to his predecessor. The state recognizes in him the rights of a civil corporation. He enjoys besides the greatest liberty while regarding canonical rules, in nominating vicars, creating parishes, erecting churches and parsonages. Each vicar keeps a registry of births, marriages and deaths. In French-Canada the vicar has the right of tithes for his maintenance. This tithe in spite of its name is but a twenty-sixth part; it is raised on grain alone, and the tendency is more and more to pay it in money. No vicar is irremovable.

(*b*) *Religious Communities.*—There are today in Canada about 38 communities of men, either priests or brothers; and about 83 communities of women. The priests devote themselves to various forms of charity, of teaching, to parochial ministry or to preaching. They include Sulpicians, Jesuits, the Oblate Fathers of Mary the Immaculate, the clerks of Saint Viator, Dominicans, Franciscans, Redemptorists, the Fathers of the Holy Cross, of the Company of Mary, Eudistes, Basilians, of the Holy Sacrament and several others. The

Brothers of the Christian Schools to the number of 760 have 66 establishments, and instruct 25,000 pupils. The Sisters are to be found in every kind of devoted work: hospitals, asylums, industrial schools, almshouses, refuges, orphanages, in one word all the miseries that the crowded cities multiply find succor from them. Mention will be made only of the orders found in Canada:

NAMES	Diocese	Year of Foundation	Members	Houses
Ursulines of Quebec	Quebec	1639	101	5
Congregation of Our Lady	Montreal	1657	2,000	156
Grey Nuns, divided since 1854, in 5 independent provinces.	Montreal	1747	1,097	64
	Quebec	1849	990	44
	St. Hyacinthe	1840	450	19
	Ottawa	1845	1,060	96
	Nicolet	1886	129	10
Sisters Mercy of Jesus	Quebec	1693	83	3
Ursulines	Trois-Rivières	1697	179	5
Sisters of				
Providence	Montreal	1843	2,065	99
Jesus and Mary	Montreal	1843	1,818	133
Holy Cross	Montreal	1847	841	51
Mercy	Montreal	1848	220	14
Saint Ann	Montreal	1850	1,236	71
Immac. Conception	Montreal	1902	.....	3
Saint Joseph	Montreal	1857	80	5
Servants of the Immaculate Heart of Mary	Quebec	1850	480	30
Sisters of the Assumption	Nicolet	1853	646	57
Providence of Kingston	Kingston	1860	167	14
Precious Blood	St. Hyacinthe	1861	350	14
Holy Family	St. John, N. B	1874	723	45
Institut de Saint Joseph	St. Hyacinthe	1877	200	28
Our Lady of Holy Rosary	Rimouski	1879	168	27
Saint Martha	St. Hyacinthe	1883	62	2
Dominican Sisters of the Holy Child	Quebec	1887	172	8
Franciscan Sisters of Mary	Quebec	1889	253	12
Our Lady of Perpetual Help	Quebec	1892	198	21
Servants of Jesus and Mary	Ottawa	1895	48	2

(c) *Universities and Seminaries.*—There are three Catholic universities in Canada: Laval in Quebec, Laval in Montreal, and the University of Ottawa, founded by Monsignor Guigues. The first two comprise all faculties except sciences. Medicine, law and letters have well-endowed chairs. Theology has distinctive faculties in the great seminaries of Quebec and of Montreal, the last opened by the Sulpicians in 1840. The University of Ottawa has only the faculties of theology and arts. Secondary education is disseminated by 17 colleges in the province of Quebec, all affiliated to Laval University, which alone confers university degrees. To these colleges must be added others opened in recent years, namely Loyola College in Montreal, Sudbury in Ontario, Saint Albert in Alberta and Saint Boniface in Manitoba. Saint Augustine's Seminary in Toronto, opened in 1913, is a faculty of theology. Young men destined for the priesthood prepare by two years of philosophy and four of theology. This preparation begins in a great seminary; that of Montreal has nearly 300 aspirants for the priesthood, that of Quebec over 100. There is besides, one at Halifax; and each religious community of men is endowed with an academy where dogmatic and moral theology, the Holy Scriptures, patrology, canon law, Church history and the pastorate are taught. Those young priests who are most distinguished for their intelligence are sent by their bishops to Rome to the Canadian College, founded by the Sulpicians in 1888, where they follow courses given by learned professors of the Roman universities and return with the degrees of doctors in philosophy, in divinity or in canon law. Consult Hopkins, 'Canada: an Encyclopedia of the Country,' Vol. V (Toronto 1898). Two important events took place in recent years; one in 1910, the Plenary Council of Quebec, at which all the bishops of Canada assisted, under the presidency of the papal delegate, Monsignor Sbaretti. At this council new laws were enacted and the old laws were confirmed. The other event was the solemn Eucharistic Congress, the XXIst of the series, which proved to be a wonderful success, the whole population of Montreal, Protestants as well as Catholics, joining hands in the celebration of this great event.

French-Canadian Catholics believe that they have been called by Providence to personate on American soil the rôle that France personated in the Old World. They look upon themselves as destined to fill a mission, and that mission the one that France has filled in Europe; to carry high the banner of the Catholic Church, and among races more inclined to positivism, maintain and propagate the instinct of disinterested devotion, and the worship of the ideal. Consult Casgrain, 'Histoire de la Vénérable de l'Incarnation,' t. I. p. 95; Gailly de Taurines, 'La nation Canadienne,' ch. XXV, pp. 280–91; Massom, 'Le Canada francais et la Providence' (Quebec 1875); Ragey, P., 'Une nouvelle France' (Paris 1902).

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27. THE FRENCH CANADIAN. Geographical Distribution.— In 1911, according to the last Dominion census, 2,055,000 inhabitants of Canada were of French origin, being over 28 per cent of the whole population, and showing an increase of 24 per cent since the census of 1901. Of these by far the greater part, 1,605,000, were settled in the province of Quebec, forming 80 per cent of the total population of that province. But considerable numbers were located in some of the other provinces: 202,000 in Ontario, 98,000 in New Brunswick, 51,000 in Nova Scotia, 13,000 in Prince Edward Island, 31,000 in Manitoba, 23,000 in Saskatchewan, 20,000 in Alberta, and 700 in the Yukon and the Northwest Territories. The French population of Canada has doubled every 27 years for the past 200 years. Then, according to the last United States census, there were, in 1910, throughout the Union, over 400,000 Canadian-born French; and the total number of people of French Canadian extraction in the United States, if local statistics are to be credited, would exceed 1,000,000. From the point of view of physical and social geography, the French Canadian element in North America is made up as follows:

(1) The main body, 1,800,000 strong, extends uninterruptedly over Quebec, eastern and northern Ontario and northern New Brunswick. The nucleus of this main body is a compact community of farmers occupying the banks of the Saint Lawrence and the valleys of its

tributaries. On the outskirts of this central group, over the wooded and rocky highlands, north and south of the great river, but more especially throughout the plateaus of northern Quebec, northeastern Ontario and northern New Brunswick, farming is largely supplemented by lumbering, and not infrequently by mining; while along the Gulf and sea-coast of Labrador, the Gaspé Peninsula, Chaleurs Bay and eastern New Brunswick it is more or less superseded by fishing.

(2) Then hardly separated from these, and from one another, we have, off the extreme eastern limit of this central group, the French-speaking communities of fishermen of Nova Scotia and Prince Edward Island; while, as a projection from the opposite extreme western border, in Ontario, we find, along the shores of the Saint Lawrence and the Great Lakes, a string of small settlements of French Canadian rivermen, boatmen and woodsmen, forming an almost continuous chain around that province and connecting, as it were, the two large French groups of Detroit River and Georgian Bay with the still larger one occupying the western bank of the Ottawa. Over one-third, namely, about 680,000 of the total French element composing this main body and its projections are congregated in villages, towns or cities, where they make a living through physical labor, trading, the crafts and the liberal professions.

(3) As distinct outliers from the above main group, we have, in the first place, the many French-speaking communities of urban population, which, in very large, though fluctuating numbers, are spread throughout the manufacturing towns of the North Atlantic States of the Union, principally Massachusetts; in the second place, smaller and sparser groups of French-speaking farmers (at times woodsmen and miners as well), to be found in the Western country, in Manitoba, Alberta and in some States of the North Central division of the Union, especially Michigan, Wisconsin, Minnesota and Illinois; in the third place, still smaller and sparser groups of French Canadian prospectors or miners, spread in the camps and towns of British Columbia, the Yukon and some of the States of the Western division of the Union, principally Montana and California. Lastly, French Canadian families or individuals are to be found in every part of the Union, though in the States of the South Atlantic, South Central and Western divisions they aggregate in most cases a few units or a few hundred only. About 40 per cent of the total French Canadian element in the United States are located in 160 principal cities.

Social Features.— The most widespread, fundamental and characteristic type of the French Canadian is the habitant, or farmer, of the province of Quebec (q.v.). From a study of his conditions there may be gathered the clearest idea of the capabilities and limitations of the race as a whole. Three main groupings are distinctive of social life in the French Canadian country: the habitant's household, the range, the parish.

(1) The habitant's household normally consists of two families, that of the senior householder, and that of an associate son and heir; it includes generally sisters and younger brothers of the heir, children of the younger couple, and, in some cases, sisters of the senior father of family. We have thus a group of some 10 or more persons, closely bound together, not only by ties of kinship and family love, but by co-operative effort, community of interest and habits of mutual dependence, which extend, in a measure, even to those members of the group who have settled outside of the family circle. The habitant's household is primarily a labor organism, a workshop. Agriculture is its mainstay; but it is of a type neither extensive nor intensive, its scope being narrowed down to the task of satisfying directly the household's needs, and limited by the household's internal supply of labor. The farms seldom exceed 100 acres in area, and outside help is resorted to in very exceptional cases only. To avoid this contingency, women and children are called upon to work in the fields, especially in haying and harvesting time. On the other hand, the object being to provide directly, as far as circumstances will permit, for all the requirements of the family, habitant farming is greatly diversified. On almost every farm there are to be found, beside the kitchen-garden and its few fruit trees, small patches of flax, tobacco, potatoes, Indian corn, buckwheat and barley, while larger areas are given to other cereals, hay and pasturage. Similarly, all kinds of stock are kept on each farm, though seldom any in large numbers or of excellent quality. Various home industries, such as the spinning and weaving of both flax and wool, the manufacture of maple syrup and sugar, carpentry, joinery, cooperage, brush-making, leather-working, etc., are an important factor on many farms. Agriculture is seldom the sole means of living of the habitant, since in the newer settlements the mere gathering of natural products, such as fish, game, wild fruits and wood is largely resorted to, while in the older and more densely populated sections by-industries are conspicuous. Then again temporary emigration to and employment in the manfacturing, mining and lumbering centres of Canada and the United States is, in all situations, an occasional means of securing capital to start out in life or of bridging over hard times. The methods of farming of the habitant, his rotation of crops, his processes of retting and breaking flax, dyeing wool, making candles, etc., are traditional and have been in use for centuries in certain provinces of France. However, in recent years, the wave of modern progress has been felt, agricultural machinery has come into fairly general use, co-operative butter and cheese factories have been established, and, especially in the vicinity of railways, improved methods and a more specialized type of farming have been adopted. Through hard work and close economy a capable habitant will succeed, with the help of his family, in building up a homestead of sufficient area to meet the wants of the household. Should his acquisitions of land during his lifetime remain within that limit, then the homestead will be transferred in its entirety to the associate son or heir, who in turn will be charged with providing for the whole family, in the same way as the testator would have done. On the other hand, should the acquisitions of the father of family exceed the area required for the support of an ordinary household, the lots in excess are freely used in helping out other sons who, after contributing to the sustenance and welfare of the pater-

nal household in their early life, undertake to make an independent living through agriculture. Girls receive very little aid from the family estate, as it is considered they will be provided for either through remaining as members of the paternal household, or through marrying into some neighboring family. Likewise, sons who are sent to college and enter the liberal professions or the priesthood receive very little else from their parents. In the management of the family affairs, the influence of the mother is about on a par with that of the father. As a rule she is better educated than her husband, sees to the correspondence and accounts, is consulted in all matters of importance and leads in the family worship. Through working with their parents on the farm the children acquire a variety of aptitudes, but no particular proficiency in any of the arts, nor any strong desire of attaining eminence in the various walks of life, barring possibly priesthood and politics. Education is reserved for the few who take to the liberal professions and the Church. The style of living is plain, and in many respects old-fashioned. Food is in abundance, though lacking in delicacy. The house, usually of wood and whitewashed, is often rather small for the accommodation of its inmates, but as a rule kept clean and tidy. Homespun, still in use in a few families in isolated sections, is fast being replaced by the cheap cotton and woolen goods supplied by the trade. Births are numerous, but owing to defective hygienic conditions, or to overwork on the part of mothers, this advantage is partially offset by the high proportion of deaths among infants. Amusements are simple, pertaining to the daily work, the family circle, Church festivals. Many of the songs and dances are importations or adaptations from Old France. However, here, as throughout the whole range of social phenomena, outside influences are apparent, and features of recent origin are found grafted on old and quaint usages.

(2) The farms are in the shape of long, narrow rectangles, 20 or 30 arpents in length, by 2 or 3 in breadth. The farm buildings are all built at one end of these rectangles, along the public road, which crosses them at right angles, thus giving a close succession of houses and barns. Not infrequently the buildings of two abutting ranges are situated on opposite sides of the same road, making a double row of almost contiguous houses, somewhat like a village street. The ranges, of which there are four or five in parallel line in every parish, connect with one another and with the village by means of «routes» or transverse roads, along which no buildings are erected; so that each range is isolated from the rest and forms a distinct grouping within the parish. This type of settlement, which differs from that of the isolated homestead to be found in some parts of France and throughout the Anglo-Saxon world, and also from the central village type observed in other parts of France and Europe, is a distinctly French Canadian creation, which the habitant takes with him wherever he settles in numbers. The range seems to have been the outcome of the desire on the part of the habitant, while residing on his own farm (which the village settlement would not allow him to do), to secure the benefit of his neighbor's assistance and company in a more effective way than the isolated homestead would permit. What the habitant cannot accomplish with the help of his family, he endeavors to do through the free help of his neighbors. However, while the nearest neighbor, on either side, may be called upon now and then to lend a hand in the ordinary work of the farm, the summoning in numbers of the near-by farmers is resorted to in exceptional cases only, such as the clearing of land, the «lifting» of a barn or the relief of some destitute family. Each range looks after its poor, by means of voluntary contributions, principally in kind. Each range has its cheese or butter factory, its schoolhouse, also its large wooden cross along the highway, in commemoration of some religious revival.

(3) The roads leading from the various ranges all centre toward a village, generally small, comprising a few lodgings, workshops and stores, besides the priest's house and the church. A community wherein the highest aim of the farmer, the basal element, is to cater to all the needs of his household directly through the labor of his own family and the occasional assistance of his neighbors does not leave much scope for the development of other social factors. The ambitions and efforts of the most capable being restrained within that limit, equality and similarity of condition is the rule. Commerce, industry, the liberal professions remain embryonic. In the absence of leaders in agriculture, industry and commerce, learning becomes the standard of distinction. A few wise old farmers, the doctor, the notary, the lawyer, are looked up to; but, on account of the exalted nature of his function, the parish priest is decidedly the dominant factor. Like the family and the range, the parish is primarily an organism for mutual support, both in the physical and moral order. It plays to a certain extent the part of an insurance company, as barns, for instance, destroyed by fire are restored through contributions from all the parishioners in material or labor. On Sundays and feast days the habitant meets at church his coparishioners, who are all relatives or close acquaintances, the doctor, the notary; he listens to the admonitions of the «curé,» to the announcements made by the public crier, and receives the intelligence and impressions which will be his mental food for the remainder of the week. To all intents, the parish may be considered as an enlargement of the family with the parish priest as its patriarchal head. Then, the parish is the main organ of local government in the French Canadian country, the school commission and the municipal corporation, of British origin and of comparatively recent introduction, remaining mere adjuncts, only partially developed, of the parish proper. The revenues of the latter often exceed those of the school commission and municipal body put together. Many localities have no town-hall other than the vestry. In practice the curé is much more the maintainer of the peace and the arbitrator of disputes within the parish than are the mayor, the local magistrates and court. His powers extend even to a close supervision of family affairs. The law of the province allows him the 26th bushel of all cereals grown by his parishioners within his territory, and his influence over the church wardens and flock enables him to obtain from close-fisted farmers the expenditure of comparatively large sums of money on church

buildings. His influence is exerted as well over the school commission and municipal council, whose policy and decisions are usually made to conform to his wishes. On the other hand, practically the only check on the curé is the far-off bishop, who visits the parish and inspects the books every third year, and may remove him at will. The school commission and municipal corporation are administered in a spirit of parsimony. School buildings are inadequate, and the teachers, generally girls, receive very little pay and give correspondingly poor results. Illiterates are still in large numbers. As each individual farmer is required to look directly after that part of the public highway which faces his property, and to contribute his share of the labor necessary for the maintenance of the cross-road leading to the village, the municipal council has little to do apart from supervising, in a general way, the repairing of roads or the occasional building or repairing of bridges within the limits of the parish. Similarly, county councils have not acquired in the French country anything like the importance which they have in English sections, and are content with looking after roads, bridges or water courses common to two or more parishes. On the other hand, provincial and Federal politics have taken quite a hold on the habitant; but the interest which he takes in them is more the outcome of his inclination for clannish warfare and oratory, and of his craving for the petty favors of officialism, than the result of a desire on his part to ensure the proper management of public affairs, which he does not always grasp. These are the prey of organized political parties, whose leaders are recruited mainly from the liberal professions and the cities. Church and politics are, in the mind of the habitant, the only avenues open to those desirous of rising in the world. And this accounts for a rather remarkable development of institutions of classical and literary teaching in a community wherein common schools are markedly deficient and technical and business training neglected.

Evolution.— On the basis of the classification of societies proposed by F. LePlay and his followers, H. de Tourville and the French school of social science, the French Canadian is a semi-patriarchal or semi-communistic type; that is one in which social organization and life, while swayed by tradition and habits of mutual dependence to a less degree than in the purely patriarchal or communistic types of the Orient, still are not permeated and uplifted by that spirit of private independence and enterprise distinctive of the individualistic or "particularistic" types, as exemplified in the Anglo-Saxon races. His semi-communistic training the French Canadian holds from France. His social ancestors were mainly the Gaul, on the one hand, the Frank on the other. The former, with his clan organization, village life and neglect of agriculture, was a distinctly communistic type. The particularistic Frank broke up, to some extent, the clannish and communistic spirit and institutions of the Gaul, and gave a strong impulse to agricultural pursuits; but his influence, for reasons which it would be too long to set forth here, was not so lasting nor so far-reaching in France as was that of his duplicate, the Saxon, in England. Thus there sprang up an intermediate type presenting many of the qualities and defects of the Celt, with something of the qualities of the Saxon. A farmer, an artisan, a trader, though generally in a small way and still conserving a fondness for nature and primitive, easy-going occupations; a race lacking ambition and ability to rise in the ordinary callings of life, having for its sole leaders the clergy and the military or civil officers of the Crown; and these leaders, though in many cases sprung from the people, isolated from them by class interests and training and unfit to lead adequately in practical pursuits. Under the trying conditions of New France — the dense forest to clear, the rigorous climate to provide against, the lurking Iroquois to evade — the peasant from north central France, single-handed, made rather slow progress at colonization. Agriculture was neglected, while the more attractive, more remunerative, though deceptive, fur trade became the means of sustenance of both the individual and the colonial government, with a consequent rapid but superficial expansion of the colony and constant warring. The French settler, fond of home and of quiet, evolved into the adventurous and hardy type of the *coureur des bois.* Under British rule, and especially in the course of the 19th century, through the restoration of peace and the advent from Great Britain of a class of business men, the fur trade, carried on by large companies, receded toward Hudson Bay and the Far West, vast lumbering operations were carried on, with a consequent impulse to agriculture, extension of settlements, increase in population; a period of unprecedented prosperity for French Canada. Then, in the latter half of the 19th century, the worldwide evolution of commerce and industry set in, with its marvelous applications of steam and electricity, its powerful machinery and means of transportation, the progress of manufacturing centres; and the French Canadians developed a class of factory operatives, together with a vigorous undergrowth of artisans and traders in the large cities. See also the articles in this series: UNDER FRENCH RULE; POPULATION AND RACIAL DISTRIBUTION; CATHOLIC EDUCATION; RELIGIOUS CONDITIONS.

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28. POPULATION: RACIAL DISTRIBUTION AND IMMIGRATION. In a new country, population grows by additions from without rather than by natural increase, and questions relating to immigration and the foreign element become of primary significance. Especially is this the case in Canada after the experiences of the present century, when in less than 20 years the inflow from abroad amounted to not less than 60 per cent of the original people. A considerable portion of this was "floating" labor whose stay in the country was brief, but even so the situation which the figures reveal is sufficiently arresting. When it is remembered that the stock of 1900 was in its turn largely composed of persons born in other countries, the importance of a careful analysis of the Canadian population from the point of view of origins is further emphasized.

Population According to Origin.— The immigration returns do not offer the final avenue to racial origins, yet, as above hinted, they throw so powerful a light on Canada in the making — on the process whose result it is the purpose of the present article to describe — that comparative statistics of 1900, 1911 and 1914–16 may be quoted as having a bearing on the matter to follow. The accompanying tabular statement (Table I) shows also the extraordinary range from which Canada has drawn population since 1900, whether as settlers intending to adopt the country permanently, or as laborers attracted by the great construction «boom» of 1900–12. The figures of earlier years are not available in similar detail, but doubtless differ mainly in degree. It will be seen that roughly 38 per cent of the recent heavy drafts came from the British Isles, 35 per cent from the United States and 27 per cent from the countries of continental Europe.

TABLE I. IMMIGRATION TO CANADA BY NATIONALITIES, FROM 1 JULY 1900 TO 31 MAR. 1916 (FISCAL YEAR).

	1900–1901	1910–1911	1914–1915	1915–1916	Totals 1901–1916
Total British Isles	11,810	123,013	43,276	8,664	1,168,292
Total British Colonies	3	2,697	433	316	21,737
Austro-Hungarian	5,692	16,285	7,150	15	200,015
Belgian	132	1,563	1,149	172	15,982
Bulgarian	......	1,068	4,048	1	18,171
Chinese	7	5,278	1,258	88	31,874
Dutch	25	931	605	186	9,793
French	360	2,041	1,206	180	25,154
German	984	2,533	2,472	27	38,798
Greek	81	777	1,298	149	9,178
Hebrew	2,765	5,146	3,107	65	75,808
Hindu	......	5	......	1	5,297
Italian	4,710	8,359	6,228	388	119,346
Japanese	6	437	592	401	16,466
Negro	......	12	202	34	1,234
Persian	......	19	7	3	192
Polish	162	2,177	1,976	8	36,173
Portuguese	......	13	8	......	109
Rumanian	152	511	361	4	8,666
Russian	1,726	8,794	5,660	179	118,938
Scandinavian	1,750	6,167	2,175	591	58,497
Serbian	23	50	220	6	1,264
Spanish	14	197	755	11	2,801
Swiss	30	270	209	42	2,483
Turkish	661	616	148	3	12,320
U. S. A. Citizens, via ocean ports	68	203	41	15	1,577
West Indian	......	455	389	47	3,577
Other	1	16	37	5	231
Total Continental, etc	19,352	66,620	41,734	2,936	835,681
From the U. S. A.	17,987	121,451	59,779	36,937	1,095,375
Total immigration	49,149	311,084	144,789	48,537	3,099,348

As has been said, not all of this influx remained. Indeed the census shows an increase in the number of those resident in Canada, but born outside, of only 887,461 during the first decade of the century (see Table II), whereas the immigrants during the same years were at least double that number. The two sets of figures, however, in the absence of statistics of emigration and of reliable vital statistics cannot be collated with the immigration returns, and Table II is to be regarded merely as a further introductory sidelight on the subject in hand.

Latest Census Reports.—For the analysis of the population as it stands to-day from a racial standpoint, recourse must be had to the specific results of the decennial census. The last census for the whole of Canada was taken in June 1911. It contained altogether 41 questions on population, one of which required the racial or tribal origin of each individual. The Canadian census does not take cognizance of «color,» as there is only a small admixture of the red, black and yellow races, which it is thought is sufficiently indicated by the returns of origins. Enumerators in taking the census are instructed to trace racial or tribal origin through the father. A person, for example, whose father is English, but whose mother is Scotch, would be ranked as «English.» It was pointed out, however, to the enumerators that such terms as «American» or «Canadian» ought not to be applied in a tribal sense. In the case of Indians, the origin is traced through the mother, and the name of their tribe given, as Chippewa, Cree, etc. Persons of mixed white and red blood, usually called «half-breeds,» were to be described, in addition to the tribal name, with the name of the white race infused in the blood. Thus «Cree F. B.» would denote that the person is a mixture of Cree and French. «Chippewa S.B.» that the person was a mixture of Chippewa and Scottish. Children of marriages between white and black or yellow races were to be classed as Negro, Mongolian (Chinese or Japanese) as the case might be. Throughout the census no attempt was made at classification by physical types, such as form of the head, facial features, etc., as this is essentially a matter of expert investigation. A question as to country of birth was added in which distinctive sections are particularized, as for example, between Bohemia and Galicia in Austria-Hungary, England and Scotland in Great Britain, etc., etc. This question was inserted largely as a check on the

TABLE II. POPULATION OF CANADA BY BIRTHPLACE.

	Population born in specified birthplace by —					
	Totals			Per cent population		
BIRTHPLACE	1901	1911	Increase	1901	1911	Increase + Decrease —
Total	5,371,315	7,206,643	1,835,328	100.00	100.00	—
Empire [1]	5,092,866	6,453,911	1,361,045	94.82	89.56	—5.26
Canada	4,671,815	5,619,682	947,867	86.98	77.98	—9.00
British Islands	390,019	784,526	394,507	7.26	10.89	+3.63
British possessions	15,864	29,188	13,324	.30	.41	+.11
British unknown and at sea	15,168	20,515	5,347	.28	.28	+.00
Europe	125,549	404,941	279,392	2.34	5.62	+3.28
Asia [2]	23,580	40,946	17,366	.44	.57	+.13
United States	127,899	303,680	175,781	2.38	4.21	+1.83
All other countries	1,421	3,165	1,744	.02	.04	+.02

[1] Includes British of unrecorded birthplace and "born at sea."
[2] Exclusive of natives of British India.

population immediately derived from the United States.

The general results of the census are exhibited in Table III, which has been constructed so as to afford comparisons with 1901, the preceding census year, and thus to reveal recent tendencies as well as present facts. Of the total Canadian population (7,206,643), it will be seen those of British race make up well over one-half, whilst the other pioneer race, the French, contribute considerably more than half the remainder. Together, the British and French races represent 82.6 per cent of the population. Those of German extraction follow with 5.5 per cent. Of the 20 other racial strains that are enumerated, only four — the Austrian, the Scandinavian, the Indian and the Jewish — amount to more than 1 per cent, none of them exceeding 2 per cent.

TABLE III. ORIGINS IN 1911 AND 1901. INCREASE IN THE 10 YEARS AND PROPORTION PER CENT OF POPULATION.

			Increase in 10 years		Number per cent of population	
ORIGINS	1911	1901	Actual	Per cent	1911	1901
British	3,896,985	3,063,195	833,790	27.22	54.08	57.03
English	1,823,150	1,260,899	562,251	44.59	25.30	23.47
Irish	1,050,384	988,721	61,663	6.24	14.58	18.41
Scotch	997,880	800,154	197,726	24.71	13.85	14.90
Welsh	24,848	13,135	11,713	89.17	.34	.24
Other	723	286	437	152.80	.01	.01
French	2,054,890	1,649,371	405,519	24.59	28.51	30.71
German	393,320	310,501	82,819	26.67	5.46	5.78
Austro-Hungarian	129,103	18,178	110,925	610.22	1.79	.34
Austrian	42,535	10,947	31,588	288.55	.59	.20
Bukovinian [1]	9,960	....	9,960	....	.14	....
Galician	35,158	5,682	29,476	518.76	.49	.11
Hungarian	11,605	1,549	10,056	649.19	.16	.03
Ruthenian [2]	29,845	....	29,845	....	.41	....
Belgian	9,593	2,994	6,599	220.41	.13	.06
Bulgarian and Rumanian	5,875	354	5,521	1,559.60	.08	.01
Chinese	27,774	17,312	10,462	60.43	.39	.32
Dutch	54,986	33,845	21,141	62.46	.76	.63
Finnish	15,497	2,502	12,995	519.38	.20	.05
Grecian	3,594	291	3,303	1,135.05	.05	.01
Hindu	2,342	....	2,342	....	.03	....
Indian	105,492	[3] 127,941	—22,449	—17.55	1.46	2.38
Italian	45,411	10,834	34,577	319.15	.63	.20
Japanese	9,021	4,738	4,283	90.39	.13	.09
Jewish	75,681	16,131	59,550	369.16	1.05	.30
Negro	16,877	17,437	—560	—3.21	.23	.32
Polish	33,365	[4] 6,285	27,080	430.87	.46	.12
Russian	43,142	19,825	23,317	117.61	.60	.37
Scandinavian	107,535	31,042	76,493	246.42	1.49	.58
Swiss	6,625	3,865	2,760	71.41	.09	.07
Turkish	3,880	1,681	2,199	130.81	.05	.03
Various	18,310	1,454	16,844	1,158.45	.25	.03
Unspecified	147,345	31,539	115,806	367.18	2.04	.59
Total population	7,206,643	5,371,315	1,835,328	34.17	....	....

[1] Included under the general term " Austrian."
[2] Included under the general term " Galician."
[3] Included half-breeds in 1901.
[4] Included with Austro-Hungarians, Germans and Russians in 1901, but given separately in this table.

The columns which analyze the trend between 1901 and 1910 are also interesting, especially when read in conjunction with the immigration statistics of Table I. The largest absolute gain during recent years has been in the persons of British origin; it has not sufficed, however, to prevent a falling off in the proportion of British to the whole, which dropped from 57 per cent to 54 per cent in the decade, notwithstanding the heavy immigration from the British Isles shown in Table I. The French stock has similarly declined from 30 to 28 per cent of the whole, but its net accretion of 405,519 (less than half that of the British), has been without any such adventitious help as the latter received, being accounted for almost wholly by the large natural increase which has for many years been characteristic in the province of Quebec. (The number of Canadian residents born in France was only 7,944 in 1901, and rose to only 17,619 in 1911). The German proportion has similarly fallen slightly, though a substantial flow of immigrants persisted up to the outbreak of the war. For the very marked percentage increases which are shown in the Austro-Hungarian, Scandinavian and Italian elements we have undoubtedly to thank the great railway- and town-building era of 1900–13, which, financed by British capital, drew so heavily upon these reservoirs of labor. It need occasion no surprise to see a recession in these elements by the time of the next census, for the enumeration of 1911 came when the expansion was at its height and the numbers of these more or less temporary residents were at their maximum. Many, of course, came as agriculturists, and these will count as permanent. The Greek and Balkan races made practically their first appearance in Canada since 1900.

It is interesting to note that among British stocks, the English alone have increased their proportion, advancing from 23.4 to 25.3 per cent of the whole, and gaining 44.5 per cent in actual numbers. The Scotch have gained 24.7 per cent, but this has not prevented them from shrinking from a proportion of 14.9 per cent in 1901 to one of 13.8 per cent in 1911. The Irish on the other hand have risen only 6.2 per cent in numbers and have rather markedly declined in proportional standing, namely, from 18.4 per cent to 14.5 per cent. The English in Canada numbered 1,823,150, the Irish 1,050,384 and the Scotch 997,800, in 1911. The French totaled 2,054,890.

Distribution of Races by Provinces.— To describe the distribution of the different races by provinces would be to write the history of the settlement of Canada. Table IV will show the general situation as it exists to-day. The earliest movement to dispossess the native Indian was, of course, that of the French into Acadia and Quebec. It ceased at the Conquest, 1759, when the population of Canada was estimated at 82,000, but the remarkable natural fertility already remarked upon has left the French not only paramount in Quebec, but constituting the second element, and that a considerable one, in New Brunswick, Nova Scotia and Prince Edward Island, the third in Ontario and the fourth in Manitoba. The first marked infusion of British stock, on the other hand, was that of the Loyalists from the thirteen colonies, 40,000 of whom crossed into Canada during the years immediately following the Treaty of Versailles, 1783. About one-half of these were divided between New Brunswick and Nova Scotia, and the rest between Quebec and Ontario, where, and especially in Ontario, they became the nucleus of a fast-growing population recruited from the British Isles. In Ontario alone by 1841, the population had risen to 455,688, and to-day, as the accompanying statement shows, the British is the predominant race in all but one of the provinces. The predominance, naturally enough, in view of recent history, is less marked in the West, but even Saskatchewan, which may be said to have been created as a community by the immigration of the past quarter of a century, has more than half of its people of British extraction, whilst the next prevailing strain numbers but 14 per cent. The German movement to Canada began to be noticeable about the time of Confederation (1867). The first 10 years of the new Dominion also witnessed three special immigrations — the precursors of several of like nature — into the West. These early movements consisted of Mennonites, Icelanders and Russian Jews, the victims, for the most part, of economic or political disadvantage, from which they sought a refuge, and with success, in the New World. A better remembered episode of the kind is the migration of the religious body known as Doukhobors, who came to Canada in the closing years of the 19th century to escape the long and relentless persecution with which they had been followed in Russia. The table will show how all these newer elements have been distributed, and what the racial problem connotes for each of the provinces. How that problem is capable of taking on new and unexpected forms has been demonstrated since the outbreak of the great war, when extensive internments of alien enemies, as well as modifications of the Franchise Act, have been made in the national interest. It was already appreciated in the increasing stringency which may be seen in the regulations regarding immigrants during the past few years. On the whole, in the absorption of these diverse and polyglot additions to her population, Canada has proceeded rapidly and with success, and if the result still leaves some unevenness, it will compare not unfavorably with the same in other new countries.

Table IV. ORIGINS OF THE CANADIAN PEOPLE BY PROVINCES, 1911,

ORIGINS	Alberta	British Columbia	Manitoba	New Brunswick	Nova Scotia	Ontario	Prince Edward Island	Quebec	Saskatchewan
British	192,698	252,683	266,415	229,896	378,700	1,927,009	78,949	316,103	251,010
English	97,955	133,186	122,798	106,017	177,701	884,432	22,176	153,295	124,091
Irish	36,739	40,642	58,463	74,570	54,244	608,137	19,900	103,147	53,865
Scotch	54,884	74,493	82,861	47,949	145,535	424,873	36,772	58,555	70,753
Welsh	3,065	4,186	2,247	1,348	1,184	9,470	101	948	2,248
Other	55	176	46	12	36	187	....	158	53
French	19,825	8,907	30,944	98,611	51,746	202,442	13,117	1,605,339	23,251
German	36,862	11,880	34,530	3,144	38,844	192,320	550	6,145	68,628
Austro-Hungarian[1]	26,427	7,015	39,665	73	1,089	11,771	4	1,289	41,651
Belgian	1,269	938	2,453	76	556	633	8	2,103	1,538
Bulgarian and Rumanian	956	219	123	101	26	1,483	....	618	2,336
Chinese	1,787	19,568	885	93	134	2,766	6	1,578	957
Dutch	2,951	1,255	2,853	4,320	4,179	35,012	213	1,505	2,684
Greek	129	810	317	40	114	1,304	39	768	55
Hindu	3	2,292	13	2	....	17	....	14	....
Indian	11,630	20,134	7,876	1,541	1,915	23,044	248	9,993	11,718
Italian	2,139	9,721	972	384	960	21,265	23	9,576	310
Japanese	247	8,587	5	....	4	35	....	12	57
Jewish	1,486	1,265	10,741	1,021	1,360	27,015	38	30,648	2,066
Negro	979	473	209	1,079	6,541	6,747	81	401	336
Polish[2]	2,243	561	12,310	67	535	10,602	....	3,228	3,785
Russian[3]	9,421	6,896	8,841	60	601	12,618	....	1,684	18,413
Scandinavian	28,047	15,968	16,419	1,479	912	8,250	32	1,756	33,991
Swiss	1,200	796	396	63	746	1,930	2	397	1,073
Various	1,598	2,438	4,829	433	1,153	6,184	36	2,369	1,358
Unspecified	32,766	20,074	14,818	9,406	2,224	30,737	382	7,706	27,215
Total	374,663	392,480	455,614	351,889	492,338	2,523,274	93,728	2,003,232	492,432

[1] Including Austrians, Buckovinians, Galicians, Hungarians, etc.
[2] Not given separately in 1901.
[3] Including Finns in 1911.

Racial Concentration.— Special examples of local racial concentration may be noted in the presence of Jews to the number of 27,948 in Montreal, 18,237 in Toronto and 9,023 in Winnipeg; of Germans to the number of 10,633 in Kitchener, 9,775 in Toronto, 8,912 in Winnipeg, 4,619 in Hamilton and 2,758 in Regina; and of Chinese and Japanese in Vancouver to the number of 3,559 and 2,036, respectively.

Aboriginal Population.— The aboriginal population of Canada, in points of numbers, is standing still. The latest census (1916) by principal tribes is given in Table V. There has been so much admixture by intermarriage at several of the government's Indian agencies that it is impossible to classify the present Indian population completely according to tribes, and the table accounts for only 72,509. There are, however, 106,511 Indians on the official records which differentiate the Canadian Indians according to linguistic stocks. Of these 59,222 are Algonkins, 13,747 Athabascan, 595 Haida, 12,142 Iroquois, 515 Kutenai, 9,888 Salish, 1,838 Siouan, 2,834 Tsimshian, 3,230 Kwakiutl-Nootka (Wabaskau) and 2,500 nomads of British Columbia unclassified.

Table V. Census of Canadian Indians, 1916, by Principal Tribes.

Tribe	Location	Numbers
Abenaki (Algonkin stock)	Quebec	333
Algonquin (Algonkin stock)	Ontario and Quebec	822
Assiniboine (Siouan stock)	Sask. and Alta	207
Athabascan tribes (Athabaskan stock)	N. W. T., Alta., British Columbia, Manitoba and Sask	7,976
Bella Coola (Salish stock)	British Columbia	215
Bella Bella (Wabaskan stock)	British Columbia	311
Blackfoot (Algonkin stock)	Alberta	2,317
Coast Salish (Salish stock)	British Columbia	4,126
Delaware (Algonkin stock)	Ontario	127
Haida (Haida or Skittagatan stock)	British Columbia	595
Hurons (Iroquoian stock)	Quebec and Ontario	519
Interior Salish (Salish stock)	British Columbia	5,480
Iroquois (Iroquoian stock)	Ontario, Quebec and Alberta	11,623
Kutenai	British Columbia	582
Kwakiutl (Wabaskan stock)	British Columbia	1,140
Malecites (Algonkin stock)	Quebec and New Brunswick	898
Micmacs (Algonkin stock)	Quebec, New Brunswick and Nova Scotia	3,590
Montagnais (Algonkin stock)	Quebec	2,071
Nootka (Wabaskan stock)	British Columbia	1,779
Ojibwa or Chippewa (Algonkin stock)	Saskatchewan, Alberta, Ontario and Manitoba	16,315
Plain Cree (Algonkin stock)	Saskatchewan and Alberta	6,816
Pottawatomi (Algonkin stock)	Ontario	178
Sarcee (Athabaskan stock)	Alberta	188
Sioux (Siouan stock)	Manitoba, Saskatchewan	590
Swampy Cree (Algonkin stock)	Manitoba and Saskatchewan	877
Tsimshian (Tsimshian stock)	British Columbia	2,834
Total		72,509

Negro Population.— The Negro is not a problem in Canada. All told, he numbers less than 17,000. More than three-fourths are divided between Nova Scotia and the southern counties of Ontario. The latter are descendants mainly of fugitive American slaves, but the former came originally from Jamaica, a band of negro «maroons» having been brought by the British government to construct the citadel of Halifax, whence they scattered over the neighborhood. Windsor, Ontario, has over a thousand negroes and Halifax 800, and these are the largest colonies.

Oriental Population.— The problem of the Oriental immigrant calls for special remark. Against the Oriental alone as a race has Canada reared a barrier which is intended to prevent ingress. In the case of the Chinese, a head tax of $50 was imposed as far back as 1885. In 1901 this was increased to $100, and in 1904 to $500. So many, however, have been the opportunities for profitable labor for the Chinaman in Canada that after a couple of years' cessation the movement recommenced, and over 28,000 landed in Canada, paying over half a million dollars in head tax, between 1905 and 1915. In the case of the Japanese, the matter was less easy of adjustment: no such means could be employed against a proud and powerful nation, the ally of the mother country. An arrangement, however, was arrived at by negotiations, and since 1907 the arrivals of Japanese have been voluntarily limited to a few hundred a year. The Hindu immigration presented a scarcely less embarrassing problem, owing to the inter-imperial relations of the two countries. In all cases, the policy of the Dominion was based on the same principle — the desire not to be overstocked by a people of lower standards of living, incapable of assimilation with European races. The employing class upon the whole has favored the freer admission of Orientals, but labor has resolutely set its face against it, and has thus far secured the backing of public opinion.

Population and Language.— Race and language go hand in hand. By the British North American Act, 1867, the Dominion has two official languages, English and French. The province of Quebec is likewise bi-lingual. With the growth of the French population in Ontario, an agitation has arisen for the extension of the privileges conferred upon the French tongue in the schools, and the door has been opened upon a persistent and disturbing controversy. No record of the language spoken by the people was taken at the 1911 census, but in 1901 there were 3,709,370 over five years of age able to speak English and 1,514,977 able to speak French. The number of French able to speak both languages has always exceeded that of the English similarly endowed. In 1901 it was 529,552, compared with 126,078 English able to speak French. There were in 1901 1,019,261 unable to speak English, 3,213,654 unable to speak French and 160,814 (chiefly Indians and recent immigrants) unable to speak either of the official languages.

R. H. Coats,
Dominion Statistician and Controller of Census.

29. IMMIGRATION. Opportunities for. The Dominion has witnessed within recent years a great increase of immigration, more especially from the British Isles and the United States, but also from the Scandinavian kingdoms, France, Belgium and other countries of Europe. Within the past decade the Dominion has received more than 2,000,000 immigrants, nearly all of a most desirable class, and the large majority devoted to agriculture, ready and able to do their part in developing the practically unlimited wealth of Canada's vast grain-growing area, estimated at 171,000,000 acres, of which about 35,000,000 acres are now under cultivation. During the year 1915, 12,986,400 acres produced wheat, and the entire wheat crop harvested was more than 393,000,000 bushels, almost double the annual importation of wheat for the British Isles.

The cheapness of land, its unparalleled productiveness, the certainty of comfort and independence as the reward of industry and thrift, and the security of life and property under a well-regulated administration, are the chief inducements which have already attracted hundreds of thousands of Britons and Americans to the Canadian West, and which are continuing to bring them.

English-speaking settlers from the British Isles and the United States form the much greater part of the new population. Scandinavians, French, Belgians, Russians, Swiss, Italians and other nationalities are also represented in the arrivals. The Doukhobors, from Russia, have proved an industrious and valuable addition to Canada's population. They are almost exclusively engaged in farming.

The lands offered to settlers by the Canadian government are situated west of Lake Superior, and to the north of Minnesota, North Dakota and Montana, and east of the Rocky Mountains, in the provinces of Manitoba, Saskatchewan and Alberta. The land is for the most part prairie, and can be secured absolutely free from timber and stones, if desired, the soil being the very best alluvial black loam, from one to two feet deep, with a clay subsoil. It is just rolling enough to give it good drainage, and in a great many places there is plenty of timber, and in other places it is underlaid with good coal. The land may be secured by homesteading. The entry fee for a homestead of 160 acres is $10, there being no further money consideration. The settler, before receiving his patent, must live upon the land three years, a residence of six months in each year being necessary, and he must also do a small amount of cultivation.

An alien that is a person not a British subject, may make application for a free homestead at once on his arrival in Canada, but he must become naturalized, or give proof of intention to become naturalized, before he can obtain a patent for the land. A residence of five years in British Dominions — the last year Canada — is necessary to acquire naturalization. In the meantime the homesteader may reside on, and exercise every right of, possession, save that he may not mortgage or sell the land until he gets his patent or title.

Though there are tracts of forest in the Canadian Northwest, there are localities where the quantity of building timber and other building material is limited, and the government has made provision for such cases. Should a man settle on a quarter section of land void of timber, he can, by making application to the Dominion lands agent in the locality, obtain a permit to cut on government lands free of charge the following: (1) 3,000 lineal feet of building timber, measuring no more than 12 inches at the butt, or 9,250 feet board measure. (2) 400 roofing poles. (3) 2,000 fencing rails and 500 fence posts, seven feet long, and not exceeding five inches in diameter at the small end. (4) 30 cords of firewood. The settler having all these free of charge has only the expense of cutting and hauling them to his homestead, which cannot cost him a great deal. He is also very likely to have the benefit of cheap coal; there are areas of coal in western Canada of such an extent as to be practically inexhaustible. The principal districts of western Canada are within easy reach of firewood, while the settlers of Alberta and Saskatchewan are particularly favored, especially along the various streams, at which they may get all the coal they require, very frequently at the cost of handling and hauling it home. If a settler should desire to go into stock raising, and his quarter section of 160 acres should not prove sufficient to furnish pasturage for his stock, he can make application to the land commissioner for a lease of grazing lands at a very low cost.

The public school system is established all through the country, and there are schools in all the organized school districts. There is a ready market for cereals and other produce; the climate is healthful and agreeable.

The aim of the Dominion government is to attract to Canada industrious, intelligent, energetic settlers with the purpose and ability to do their part in building up a nation imperial in its natural resources and in the extent of its magnificent territory: in the carrying out of this policy the government is meeting with eminent success. See CANADA — POPULATION, RACIAL DISTRIBUTION AND IMMIGRATION.

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30. MILITARY SYSTEM. Historical. The Canadian military system has its roots in the principle of universal, compulsory military service. This principle was firmly established in the French colony on the Saint Lawrence; when this colony passed under the British flag and was supplemented by English-speaking colonies to the east and the west the principle was maintained. The general system of defense in use by Great Britain for her North American colonies in the first half of the 19th century provided wholly against attack from the south; at that period there existed an antagonism between the British empire and the United States which a century of peace fortunately has removed. The method adopted was (1) to maintain in the North American colonies (Upper and Lower Canada, New Brunswick, Nova Scotia, etc.) a garrison of the British regular army, which until about 1840 was roughly equal in strength to the regular army of the United States; (2) so to organize the male inhabitants of the colonies as to facilitate their embodiment in emergency in firmly organized corps, under regular conditions and discipline and under the leadership of regular officers; (3) to provide in advance arms, stores and equipment for these native troops. By the militia until 1862 was meant the peace organization of the male inhabitants of the country suited to this scheme. No attempt was made at peace *training;* the effort made was to impress upon the people's minds the universal obligation of service and to provide for the rapid and orderly raising of service corps. There was an annual muster parade of all men of military age, and all liable to serve were divided into regiments and companies; local officers were appointed, but these officers were for duties of administration rather than of leadership, and if the need of mobilization had occurred their function would have been to select from their formations suitable men to be organized into service corps, which, as already stated, would have been trained and led under the supervision of the regular army. The mainspring of this system was the presence in the country of a comparatively large force of regulars, and when, after the Crimean War, the government of

Great Britain gradually denuded the colonies of regular troops, and at last withdrew these almost altogether from Canada, the old organization fell into decay. Early in the second half of the 19th century the second phase set in with the organization of a number of separate volunteer corps; the citizen soldiers comprising these drilled in their spare time after the manner now familiar on the North American continent, and the volunteers gradually supplanted the old militia. The slight Fenian raids of 1866 and 1870 were repelled mainly by the use of these volunteers, and after confederation in 1867 the whole defense of Canada was committed to a new volunteer militia of this type. The principle of universal compulsory service remained on the statute book, but in practice there was no compulsion and the Dominion kept up a voluntarily enlisted citizen force. In corps enlisted in the cities the regiments trained by evening drills; the corps raised in rural districts went to camp for 12 days in the year. The training was imperfect, and higher organization, stores for mobilization and staff services were neglected. In 1870 the British troops were finally withdrawn from the Dominion, with the exception of the naval stations of Halifax and Esquimalt, and from that year to the period of the South African War the military equipment of the country was slight. A revolt by a few half-breeds and Indians in the Northwest territories in 1885 was put down wholly by the forces of the Dominion, about 5,000 being employed. To the struggle in South Africa the Dominion contributed about 8,000 men; of these 7,000 crossed the sea, while the remainder undertook the garrisoning of Halifax, and so released an equivalent number of the British regular army for active service. All the corps so employed were specially raised for the war. The experience of this war, and the gradual deepening of the diplomatic dangers which led to the great European War, caused Canadian statesmen and soldiers to reorganize the defensive forces of the country. The process was a gradual one; it began about 1902 and was still in progress when the explosion of 1914 occurred.

The Militia Act.— The foundation of the new organization is the Militia Act of 1904, and as this constitutes the legal authority by virtue of which the land forces of Canada exist, it may be noticed at some length. During the Great War it has been modified in some respects, partly by statutes and partly by regulations enacted under the authority of the War Measure Act. The command in chief is vested in His Majesty the King, with the governor-general as his representative. The administration of the force is entrusted to the Minister of Militia and Defense; he is a member of the Dominion Cabinet, he must be a member of Parliament and he can be held to account by that body. In the summer of 1916 a parliamentary under-secretary was appointed to assist the Minister in administering the department; early in 1918 this office was discontinued. Following recent British example, the Minister is assisted by a militia council, composed of four military and two civil members. The military members are the chief of the general staff, the adjutant-general, the quartermaster-general and the master-general of the ordnance. The civil members are the deputy minister and the paymaster-general. Each of these officers presides over a branch of the department, and the business of administering the force is distributed among these branches. The Minister presides over the meetings of the council and acts affecting the administration of the militia technically issue from the Minister in council; in practice the decision lies with the Minister. Outside of the militia council stand two inspectors-general, officers of rank, who report upon the quality of the training, etc., of the troops. The country is divided into 11 military districts, each under a district officer commanding, who is either a colonel or a general officer; in the interests of decentralization considerable powers of administration are entrusted to these officers.

All the male inhabitants of Canada from 18 to 60 years of age are liable to military service. To this general rule there are some exceptions, such as judges, clergymen and professors in colleges. In cases of great emergency a «Levee en Masse» may be ordered, when all male inhabitants capable of bearing arms can be summoned. Those ordinarily liable to service are divided into four classes: (1) Those 18 years of age to 30, unmarried, or widowers without children; (2) 30 years of age to 45, unmarried, or widowers without children; (3) 18 to 45 who are married, or widowers with children; (4) 45 and upwards, but under 60. The principle of substitution is recognized. It is in this order that the Militia Act of 1904 contemplated the summoning of the male population to the colors. When in the stress of the Great European War resort was had to compulsion for overseas the foregoing classification was rearranged, and the principle of substitution disappeared. The Militia Act limited compulsory service in the field to 18 months at most; this limitation disappeared. The militia may be sent on active service «anywhere in Canada and also beyond Canada for the defense thereof.» When in time of war the «militia is called out for active service to serve conjointly with His Majesty's regular forces, His Majesty may place in command thereof a senior general officer of his regular army.» In the census year of 1911 the number of males in Canada between 18 and 45 was 1,720,000; of these 1,109,000 were native-born, 306,000 were British born and 304,000 were foreign-born.

Later Organization.— During the period 1902 to 1914 the professional soldiers of Great Britain once more influenced the military policy of Canada, but this time in a manner consistent with the autonomy attained by the Dominion in the British empire. During the greater portion of this period the sailors and soldiers of the empire were preparing, as far as political policy allowed, for the great war which they foresaw, and which came in 1914. The general policy pursued was for the United Kingdom to prepare its forces to meet the first shock of the conflict, and for the Dominions — Canada, Australia, New Zealand and South Africa — so to organize their citizen forces as to enable them in the event of war rapidly to raise forces which would fit into the general British military system. This implied (1) common establishments; it was understood, for example, that if Canada raised a division for war service, it would be identical as to number of battalions, proportion of artillery, details of staff, etc., with the divisions of the British army. (2) A considerable amount of staff work, in the shape of mobilization arrangements, plans of organization, etc. (3) The provision of arms, stores, equipment, etc., for a force of the size which Canada might reasonably be expected to raise. Such plans were prepared and carried out to a certain extent in Canada. The foundations of them are to be found in a series of agreements made at the Imperial Conferences of 1907, 1909 and 1911 and set forth in blue-books published in those years; these agreements were concluded between the statesmen of the mother country and the Dominions, assisted by soldiers and sailors representing the several parts of the empire concerned. The details were worked out by a number of staff officers, in part supplied from the British army, in part belonging to the Canadian establishment. The organization of the Canadian forces was stimulated by two visits of inspection paid by distinguished officers, by Sir John French in 1910, and by Sir Ian Hamilton in 1912; their advice proved of great value. The general Canadian organization was based on the theory that the militia was to provide the framework of corps, officers, arms, training establishments, etc., of an army to resist invasion; the first line was to be 125,000 strong and behind was to be a second line of reinforcing units, also 125,000 strong. The country east of Lake Superior was divided into six areas, each of which was to provide a self-contained division of all arms. In the region west of Lake Superior were a considerable number of mounted units and a number of infantry corps, which it was planned ultimately would form a Seventh Division. Provision also was made for a number of mounted brigades. Theoretically this organization faced southward; in point of fact, the real danger apprehended was across the Atlantic.

In this period the organization and numbers of the militia changed rapidly, the general aim being to attain a proper distribution of arms; the force had comprised too large a proportion of infantry, with too small a supply of cavalry and artillery. Several instructional corps, known as the Permanent Force, had existed from about 1880; early in the 20th century this force was considerably increased, partly because the Dominion undertook to garrison the Imperial fortresses of Halifax and Esquimalt, and partly because the militia needed more ample facilities for training. By 1914 the authorized establishment of this Permanent Force was 5,000 and the actual strength was about 3,000. The organizations included: cavalry, 4 squadrons; horse artillery, 2 batteries; garrison artillery, 5 companies; engineers, 3 companies; infantry, 1 battalion; and also army service corps, army medical corps, army veterinary corps, ordnance corps, army pay corps, military staff clerks, etc. The active militia comprised in 1914: cavalry, 130 squadrons; field artillery, 38 batteries; heavy artillery, 5 batteries; siege artillery, 2 batteries; garrison artillery, 13 companies; engineers, 4 field troops, 9 field companies, 9 telegraph detachments, 1 wireless telegraph detachment; infantry, 104 battalions; signal corps, 4 companies and 3 independent sections; army service corps, 18 companies; army medical corps, 21 field ambulances; and sundry auxiliary services. The war establishments of these units would not be far short of 150,000.

These corps were distributed into higher formations in accordance with the plan already outlined: the organization was not complete in 1914; there still being an excess of infantry and deficiency of some of the other arms, notably of artillery. A feature of this period was the provision of special troops for the auxiliary services — army medical corps, army service corps (for supply and transport), ordnance store corps, a corps of guides (for intelligence work), and similar organizations. Citizen soldiers proved particularly adapted to these ancillary services, and often attained much proficiency in them. The number of the active militia trained, which before the South African War had been fewer than 20,000, by 1914 had risen to nearly 60,000. With all this improvement in organization the progress in training was slower. Something was done in substituting practical work for the older close-order drill and ceremonial, and rifle-shooting was encouraged, but the bulk of the militia had to content themselves with 12 days' training in the year.

Training establishments had been increased during these years. The oldest of these is the Royal Military College at Kingston; founded in 1876 in professed imitation of West Point, this institution gives an excellent general education, and in addition fits its graduates to be officers in the regular army. A proportion of its graduates have entered the Imperial forces, others are in the Canadian Permanent Force, while the larger number have entered civil life, but have constituted a reserve of military skill. Schools of artillery, cavalry and infantry long have been conducted at certain centres, and these of late have been multiplied, while instruction has been carried to the militia by detaching instructors from the permanent corps to conduct temporary courses at the headquarters of militia units. Rifle-shooting, for many years a popular pastime, has been stimulated, partly by the establishment at Rockliffe, near Ottawa, of a School of Musketry, modelled upon the British institution at Hythe, partly by the encouragement of rifle clubs, both for military and civilian. Persons enrolling themselves in civilian rifle clubs did so on the condition that "in case of emergency" they should at once become members of the active militia. The government in addition to annual grants supplied a limited number of rifles to each club, with a fair proportion of free ammunition; much energy was shown in providing ranges for these numerous and widely scattered clubs. By 1914 these institutions had increased to 167 military and 433 civilian clubs, and had attained a membership of 52,000. Shooting by members of the militia is actively encouraged. Both the Dominion and provincial governments give monetary grants to the Dominion and provincial rifle associations, the annual meetings of these bodies being well attended, both by militiamen, members of the rifle associations and cadets.

To serve as feeders to the militia, and to disseminate military knowledge and aptitude at an age when lessons are easily learned, the militia department before 1914 had done its utmost to encourage the cadet movement. Corps were formed in the schools, the provincial governments (in whose hands the control of education is vested under the Canadian constitution) co-operating with the Dominion government. The movement began in 1908; by 1911 there were 492 companies and 19,250 cadets; by 31 March 1916 the numbers had increased to 1,428 companies and 57,000 cadets. Of these units 76 were affiliated or attached to militia organizations; 26,000 cadets were drawn from secondary schools, 25,500 from primary schools and 5,000 were in corps fostered by municipalities or government institutions. In 1912 cadet camps were formed, and in the years before the outbreak of the war these camps were attended by from 12,000 to 20,000 lads; a good deal also was done to teach cadets rifle-shooting.

In regard to the provision of arms the most important step taken was the establishment in 1904 of the Ross rifle factory at Quebec; this institution until the summer of 1916 manufactured the Ross rifle, a type of weapon differing in many respects from the Lee Enfield, the military rifle used elsewhere in the British empire, but of the same calibre and taking the same ammunition. The capacity of this factory before the war was 12,000 rifles a year, and in 1914 there were about 70,000 Ross rifles in the country, some of them of an earlier make which was unsuitable for campaigning. In 1916 the Canadian troops in France were rearmed with the Lee Enfield, and the Ross rifle factory, which had been much enlarged, was changed to the manufacture of that weapon. In 1917 this factory was taken over by the government. A small arsenal exists at Quebec, capable in 1914 of turning out several million rounds annually; it also made a limited quantity of 18-pounder shells. A second arsenal has been established at Lindsay, Ontario; it began to manufacture ammunition in 1917. The government by 1914 had provided about 100 guns, mostly 13- and 18-pounder horse and field quick-firing guns; it also had a few medium guns, 4.7-inch and 60-pounders. The supply of machine guns was scanty. Something was done toward providing mobilization stores, i.e., clothing and other necessary articles which would be required by the new men who would be brought into the regiments when they were increased to their war strength.

Participation in the Great War.— Canada unhesitatingly took part in the European War. Mention already has been made of the plans framed by the military authorities; these included confidential plans for the dispatching abroad, in the event of a war in Europe, of an expeditionary force comprising a division (i.e., 12 battalions of infantry, with the necessary complement of artillery and other troops, in all about 18,000 men) and a mounted brigade (about 2,000 mounted rifles). Detailed plans for the enlistment and mobilization of these had been matured; the troops were to be specially enlisted, the militia organization being employed to raise this force. On 1 Aug. 1914 the Canadian government telegraphed to London offering a contingent, and on 6 August the British government replied accepting, and suggesting that the force sent consist of one division and a "first reinforcement" of 10 per cent; in all, including subsidiary services, some 22,000 of all ranks. Recruiting was so ardent and districts so vied in providing corps, that instead of 12 battalions 17 were raised almost instantaneously; in addition another battalion, the Princess Patricia's Canadian Light Infantry, was raised from former British soldiers residing in Canada. These 18 battalions, with other corps, numbering in all 33,000 all ranks, sailed from Quebec late in September and landed at Plymouth on 15 Oct. 1914. This was a force raised *ad hoc,* and in a sense was outside the active militia, although it was based upon that force. The liability of the militia to serve abroad has been noted earlier; no attempt was made to apply this liability, the course followed being to organize, under the Militia Act, a new force known as the Canadian Expeditionary Force. The term of service is the duration of the war, with a minimum of one year. The active militia supplied nearly all of the officers and many of the men of the first division, and its whole machinery was employed in raising, organizing and outfitting this overseas army. Many, however, of the rank and file had not previously served in the militia, and this fact, coupled with the slight training afforded in any case, made it necessary to give the whole force several months of training before sending it to the Continent. Something was done, especially in the way of musketry, at the great mobilization camp at Valcartier, near Quebec. On landing in England the division was placed under the command of a British general, and it spent the winter upon Salisbury Plain, training amid discouraging conditions of weather — conditions which were shared by scores of divisions of new troops which had been raised in Great Britain. In February 1915 the First Division, as it now was, crossed the Channel, leaving the surplus five battalions in England to serve as feeders. This division was heavily engaged in April at the second battle of Ypres, or Saint Julien as it sometimes is termed, sustaining some 6,000 casualties. Before the First Division was well clear of the Saint Lawrence a Second Division was offered; its organization went on through the winter of 1914–15, the battalions crossing the Atlantic in single ships instead of in one great convoy as with the First Division. The same deliberate training was given to the new troops, and the Second Division was fairly organized by midsummer of 1915. When it was sent to France the two divisions were united in a Canadian Army Corps. New battalions kept working their way across the Atlantic and through the training camps in England, and by the end of the winter of 1915–16 a Third Division was complete and the Canadian Army Corps had three divisions and upward of 60,000 men. The army corps suffered upward of 10,000 casualties at Hooge in May 1916, the Third Division being the heaviest loser. A Fourth Division was then organized and in the summer of 1916 it joined the Canadian Army Corps in France. The Canadian corps was heavily engaged in the Battle of the Somme in 1916, and at Vimy, Lens and Passchendaale in 1917. Its casualties in 1917 were in excess of 84,000. At the beginning of the campaign of 1918 the Canadian Army Corps consisted of four divisions, numbering 78,000 all ranks, and about 11,000 "corps troops," principally artillery; altogether the Army Corps comprised some 90,000 troops, this being the standard large formation in the British Army. The general commanding the Army Corps, Sir Arthur Currie, was a Canadian militia officer, who had raised a battalion of the First Division. In addition there was a Canadian Cavalry Brigade serving elsewhere in the British Army, and there were large numbers of railway and forestry troops, as well as many line of communication units; all told, the Canadian troops in France of the various categories mustered approximately 150,000.

To provide for a steady flow of reinforcements to the troops in France, and for the care of wounded and sick, an extensive establishment was maintained in England, over which after the autumn of 1916 a Minister of the Canadian Cabinet presided with the title of Minister of the Overseas Military Forces of Canada. At one time a fifth division was formed, but the need for drafts to keep the other divisions up to establishment was so great that it was broken up. The establishment in England comprised numerous training schools, and the general policy settled upon in 1917 and 1918 was to forward recruits from Canada to the United Kingdom as soon after their embodiment as convenient, so as to receive their training close to the fighting. This was part of a general reorganization, more especially of the infantry. At first the method of recruitment was to authorize the raising of numerous single unrelated battalions, and in all more than 250 such battalions were formed. The four divisions in the field comprised no more than 52 battalions of infantry and pioneers, and these were reinforced whenever depleted; as a necessary consequence on arriving in England four-fifths of the infantry units raised were either converted into depot or reserve battalions, or were broken up to furnish drafts for the battalions in the fighting divisions: a course which entailed considerable hardships upon the senior officers of corps so treated, as the majority of them could not obtain employment in France. In 1917 the raising of new battalions was discontinued and the whole of the Canadian infantry were organized in 12 territorial regiments, each of several battalions. These regiments were: The Western Ontario Regiment; the 1st Central Ontario Regiment; the 2d Central Ontario Regiment; the Eastern Ontario Regiment; the 1st Quebec Regiment; the 2d Quebec Regiment; the Nova Scotia Regiment; the New Brunswick Regiment; the Manitoba Regiment; the British Columbia Regiment; the Saskatchewan Regiment; the Alberta Regiment. Each of these regiments had several fighting battalions in France, one or more reserve battalions in England, and one or more depot battalions in Canada. By this arrangement steadier and more equitable relations were established between the several services of procuring men, training them and employing them in battle. Canada maintained in England and France numerous auxiliary services, such as hospitals, Y. M. C. A. huts, etc. In addition to the forces despatched to Europe, the Dominion contributed to the garrisons of Bermuda and the West Indian island of Saint Lucia. Many individual Canadians obtained commissions in the forces of the United Kingdom, the air services in particular attracting several thousand men.

The reorganization just described coincided with a change in the method of recruitment from voluntary enlistment to compulsory service. At the outset recruiting was voluntary and in 1914 and 1915 great eagerness was shown. In all about 375,000 effective recruits were obtained in this manner, or more than 5 per cent of the population. In 1916 the stream of enlistment slackened and in 1917 the government decided to have recourse to compulsion. After some delay due to political difficulties the Military Service Act was passed, and its operations began in October 1917. The general principle was that 100,000 men were to be drafted from the unmarried men of the country between the ages of 20 and 34; liberal provision was made for exemption on grounds of medical unfitness, the dependence of others upon the draftee, indispensability for purposes of food production, war industries, etc. A system of tribunals was set up, the general principle of administration being that the draftees were obtained by the civil power, and by it turned over to the military authorities, who did not themselves come into contact with the civilian population. The military authorities on receiving the recruits so produced outfitted them in depot battalions, gave them preliminary training, and sent them to Great Britain in comparatively small drafts. In 1916, toward the close of voluntary enlistment, replacement troops were sent across the Atlantic at the rate of about 10,000 a month; in the early months of 1918, when the new system was beginning to work well, the rate of reinforcement was about the same. Side by side with compulsory service volunteering persisted and was encouraged; those coming forward voluntarily going principally into the air forces and special services.

A feature of Canadian participation in the war has been the unexpected production of munitions of war. Soon after the outbreak of the war the then Minister of Militia, Maj.-Gen., the Hon. Sir Sam Hughes, formed a shell committee, composed mainly of manufacturers, and this body, acting for the British government, placed large orders for munitions, both in Canada and in the United States. In the latter part of 1915 it was remodelled, the new organization being styled the Imperial munitions board. The two bodies were remarkably successful in inducing and encouraging Canadian industries originally designed for peaceful purposes to turn to the making of munitions. Up to the end of January 1918 the orders given to firms in Canada and the United States aggregated rather over a $1,000,000,000. It may be added that the voluntary giving of the people of Canada to Red Cross, Belgium Relief, the Canadian Patriotic Fund [an organization for caring for soldiers' dependents] so far have been about $50,000,000.

Naval Defense.— Canada took little interest in the question of helping with the naval defense of the empire until March 1909. The excitement which arose in England in that month over the naval rivalry of Germany deeply impressed Canadian public opinion, and the Canadian House of Commons by a unanimous resolution approved the principle of participation. In the autumn of 1909 representatives of the Canadian government attended the defense conference of the several parts of the empire held in London, and as a result the government of the day put forward in 1910 a project for the establishment of a separate Canadian navy; two old cruisers, the *Niobe* of 11,000 and the *Rainbow* of 3,600 tons, were bought to serve as training ships, and it was proposed to build in Canada four light cruisers of the *Bristol* class and six destroyers. In time of war this force was to be placed under the British Admiralty. A number of officers were borrowed from the Royal Navy, and a few hundred men enrolled, many of these also coming from the British navy. This proposal encountered political resistance on two grounds, one school of thought regarding it as insufficient, and another school disliking any contribution to naval defense. The administration was defeated at the polls in 1911 and retired without having ordered the ships. The administration which succeeded it consulted the Imperial government afresh, and in 1912 proposed to drop the idea of a separate navy and to present to the British navy a gift of three battleships. The opposition resisted this, putting forward an alternative plan for a Canadian navy of 2 battle cruisers, 6 light cruisers and 12 destroyers. The proposal of the government passed the House of Commons, but was rejected by the Senate, in which the opposition commanded a majority. The great war began before any further steps were taken by the government. On the outbreak of hostilities the Canadian naval forces — the two cruisers already mentioned and two submarines hastily purchased from an American shipyard on the Pacific coast, with some hundred seamen — were placed at the disposal of the Admiralty. The Canadian vessels took part in the patrolling of the Atlantic and Pacific oceans for the protection of commerce. The department of the Naval Service administered the movement of ships from Canada to Great Britain.

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31. THE ACADIAN REFUGEES. After the conquest of Acadia in 1710 — the first and only fruit of Samuel Vetch's grand design for the conquest of Canada,— the Treaty of Utrecht (see Utrecht, Peace of) provided for the free exercise of the Roman Catholic religion by such of the French inhabitants as were willing to remain there, but also stipulated that any who should choose might remove within a year. Nearly all remained; but, under various excuses, in the hope of a return of French power, they postponed taking the oath of allegiance to the British Crown until 1730. In 1745 war broke out again, and in 1749 the founding of Halifax (q.v.) by several thousand British emigrants excited the jealousy of the officials of Canada and priests of Acadia. The people were a simple and densely illiterate peasantry, taught to obey their missionaries in everything. These missionaries were chosen and directed by the bishop of Quebec and the governor of Canada as agents of French policy, and hence a very difficult position existed, both for the English and for the Acadians. Through the promptings of the fanatical Abbé Louis Joseph Le Loutre (q.v.), and the duplicity of Governor La Jonquière of Canada and the court of France, the Indians were encouraged to murder English settlers and commit other outrages, some of the Acadians even taking part in these crimes. These charges are proved by the citations from French secret documents given in Parkman's 'Montcalm and Wolfe'; and have not been effectively answered. Le Loutre, who was vicar-general of Acadia and missionary to the Micmacs, even paid 100 livres each for English scalps in time of peace; and the money was reimbursed to him by the intendant of Louisburg. He held constant threats of Micmac massacre over the Acadians themselves, compelling them to acts antagonistic to the English, and moving many of them from their farms and possessions to suit his plans. Yet his inhumanities were evidently justified in his own warped heart and intellect as services to his Church and country. The people, as a whole, would have been quite content to live in peace, being very well treated. In 1751, La Jonquière issued a proclamation commanding all Acadians to enroll themselves in the French militia. A claim was put forward that only a small part of the province was «Acadia,» as ceded to the British under the Treaty of Utrecht, and consequently that all the rest was still under the rule of the French. The latter now conceived the definite design of reconquering the province; but the English, obtaining exact information through the spy Pichon, struck first by capturing Fort Beauséjour, on the neck of the Acadian peninsula, on 16 June 1775. Fort Gaspereau, 12 miles distant, then surrendered, and the French fort at Saint John being burnt and abandoned on the approach of an English force, the whole country was left under British control. This entire plan of re-establishment was due to the forethought of Governor Lawrence, aided with due vigor by Governor Shirley (see Shirley, William) of Massachusetts.

The chief interest in the Acadians will always, however, be centred in the incidents of the famous dispersion, which were now about to begin. The projected French invasion had aroused the apprehension of the small British population and authorities, an apprehension deepened by the Indian outrages of Le Loutre and the fear of the neighboring stronghold of Louisburg. The whole of the Acadians also persistently refused the oath of allegiance. In this state of affairs, which not only seemed a great danger but appeared to imply a great ingratitude, after the mild treatment and privileges of property and religion so long extended to them, it was determined by Governor Lawrence that the only safety lay in removing the Acadian population and replacing them by New Englanders. That view had been held for some time by Governor Shirley of Massachusetts and others. Lawrence had complained bitterly to the Lords of Trade before the capture of the French forts «that this lenity has had so little effect, and that they still hold the same conduct, furnishing them [the French] with labor, provisions, and intelligence, and concealing their designs from us.» On the capture of Beauséjour, Lawrence exacted an unqualified oath of allegiance from the Acadians; and in response two successive deputations came to Halifax, representing together nine-tenths of their entire population. Both absolutely refused to take the simple pledge of fidelity and allegiance to the British sovereign. The governor and council therefore resolved that it was necessary to deport their people, and in order that they should not strengthen the enemy, they were to be distributed among the English colonies. Lawrence now ordered Colonels Moncton and Winslow and Major Hanfield,—at Beauséjour, Basin of Minas and Annapolis, respectively,—to seize the inhabitants, and if necessary to burn their houses. The principal scenes of the expulsion took place under Winslow at Grand Pré and Fort Edward, in the Basin of Minas, just after completion of the harvest at those fair and populous settlements. At Grand Pré all the males over 10 were ordered to the parish church, where Winslow read them the order of removal and detained them as prisoners. They were kept several weeks before deportation, and the year was nearly ended before all were gone. Tragic scenes of lamentation and distress accompanied the leaving, although it was carried out as humanely as possible. The whole number removed from the province is usually stated as a little over 6,000, although Richard and others place the figures much higher. Some took refuge in the forests or fled to the French territories. Lawrence sent the ships deporting them to the different colonies from Massachusetts to Georgia, where they became a charge on the people and their gradual departure was connived at. Many in the South eventually reached the French settlements of Louisiana, where their descendants are still found in certain parishes and were estimated at 40,000 a few years ago. The sorrows of the dispersion were great, and the death rate considerable. It is regrettable that those who reached Canada and the French West Indies suffered perhaps the most terrible miseries of all from neglect and ill-treatment. Most of the refugees at length found their way back to Nova Scotia and were progenitors of the greater part of the present French population. Their woful story was told in an idealized form in the pages of Haliburton, from whom, passing through a medium of feminine sentimentality in the pages of a lady writer, it reached Longfellow and was immortalized in his ‹Evangeline.› The unhappy facts were afterward the subject of heated recriminations, especially by French writers such as Abbé Casgrain and Rameau, against the New Englanders, whose leading defenders are Parkman and Hannay. Edouard Richard in his ‹Acadia› ascribes all to Lawrence personally. The dispassionate view would seem to lie in fair allowances for the difficult situation and training of the actors on both sides. In this light the Acadian population must be remembered as a densely ignorant people. Without some education, the measure of natural shrewdness they possessed could not be expected to clear up for most of them the moral problems connected with allegiance to the British Crown, and the political problem of the ownership of Acadia as it was represented to them. Most of them were undoubtedly trying to be loyal to France and ready to return the country into its possession, and duplicity did not seem to them improper. This is not only deducible from all the events but plainly set forth in the petition of 3,500 Miramichi refugees to Governor de Vaudreuil in 1756.

For the Indian atrocities, to which some of them gave support, we cannot hold the people as a whole responsible. In view of these considerations the Acadian people must be regarded as unfortunate and misled, and their condition as a conquered people, torn from their compatriots and coreligionists by the fortune of war, as they hoped only temporarily, must be considered. As in the case of ignorant populations generally, it is chiefly their leaders and advisers — Le Loutre, Jonquière and the bishop of Quebec — who must be held responsible. Regarding Le Loutre, although his character of the peculiarly savage and relentless fanatic led him into acts which place him among the class of murderous criminals, his guiding motives appear to have been a distorted patriotism and allegiance to his religion. These are in a different class from the mean duplicities and false quibbles of La Jonquière and the French ministry, who were well aware both of the untruth of their pretensions concerning the extent of Acadia, and of the dangerous position in which they were placing the Acadian people. When we examine the motives of the British side, we have to deal with practically only Lawrence and his council at Halifax. A state of war existed, and in their judgment desperate measures were necessary for the safety of the little British colony. The British settlers were greatly outnumbered and held but a small part of the country. Le Loutre and the French authorities were pursuing a treacherous course of savage murder against them, with Acadian participation. The entire people absolutely refused to take a simple oath of allegiance, although repeatedly and plainly warned of the consequence. In Lawrence's judgment no other course than deportation then seemed safe; and although a harsh measure, like its modern analogue, Reconcentration, it proved effectual in removing all doubt respecting the security of the colony. Harsh and drastic as his measures were, he is entitled to be judged, in part at least, as a military man bound to perform a duty; and his freedom of discretion at a difficult juncture must be respected even if it may have been badly used. On the side of France, two instances of a similar deportation policy are cited in defense — the proposal of Governor de Callières, endorsed by the French King in 1689, to seize the province of New York and deport all the Protestant population (Doc. Hist. N. Y. Vol. I, pp. 285–97); and the actual deportation of the English settlers from the island of Saint Kitts in 1666, to the number of 2,500, an occurrence marked by the striking of a medal by Louis XIV, inscribed «Ang. Ex Insula St. Christoph Exturbat.»

Bibliography.— Abbé Raynal, ‹Histoire des Indes,› 2d ed.; Haliburton, ‹History of Nova Scotia› (1829); Rameau, ‹La France aux Colonies› (1859); ‹Une Colonie Féodale en Amérique› (1889); Murdoch, ‹History of Nova Scotia› (1865); Akins, ‹N. S. Archives› (1869); Campbell, ‹History of Nova Scotia› (1873); Moreau, ‹Histoire de l'Acadie› (1873); Hannay, ‹History of Acadia› (1879); and ‹The Story of Acadia› (1904); Smith, ‹Acadia› (1884); Casgrain, ‹Pélérinage au Pays d'Evangeline› (1888); Parkman, ‹Montcalm and Wolfe› (1884); Hart, ‹Fall of New

France' (1888); Richard, 'Acadia' (1894). See also NOVA SCOTIA — *History*.

WILLIAM DOUW LIGHTHALL,
Author of 'The False Chevalier'; Founder of Château de Ramezay Historical Museum, etc.

32. **THE QUEBEC ACT.** From the capitulation of Montreal in 1760 down to the ratification of the Treaty of Paris in 1763 Canada was without any form of civil government, the affairs of the colony being administered by the officer in command of the British armies of occupation. But with the conclusion of peace and the definite cession of the colony to the British Crown this tentative arrangement came to an end and in the autumn of 1763 a royal proclamation decreed the establishment of a civil government in the newly-acquired colony, promising that as soon as circumstances would permit representative assemblies would be convened. In the meantime the laws of England were to be in force. In virtue of this arrangement Gen. James Murray (q.v.) was appointed to the governorship of the colony and a council of eight members was nominated to assist him in the work of administration. For the time being, justice continued to be administered by the military courts at Quebec, Three Rivers and Montreal, but in September 1764 a proclamation was issued by the governor-in-council establishing a Court of King's Bench for the trial of all causes, both civil and criminal, agreeably to the laws of England which the royal proclamation of the preceding year had declared to be in force. At the same time a Court of Common Pleas was established for the trial of actions which had arisen before the publication of the proclamation of 1763 and in regard to which the old French law had to be applied.

The immediate result of this change was to inaugurate a régime of utter judicial chaos, for the new judges were completely at a loss to apply the principles of English common law to the causes which came before them, especially where questions of real property were concerned. Accordingly, the governor-in-council during the month of November 1764 issued a further proclamation declaring that «in all actions relative to the tenure of land or the rights of inheritance, the French laws and usages shall be observed as the rule of decision.» But in all other civil cases and in all criminal cases the common law of England was to be applied. This change improved matters but slightly for the new English judges were slow to master the intricacies of French law and applied it very imperfectly where they endeavored to make it apply. To the application of the English criminal law the French inhabitants of the province made no great objection, although for the time being many of them failed to take kindly to the institution of trial by jury; but there was a widespread demand for the extension of French law to all civil causes. Complaints were likewise made that the judicial officers of the colony were for the most part ignorant of the French language; that they were often dishonest and that the legal fees charged the inhabitants were exorbitant. For all of these complaints there seems to have been considerable foundation and in fact the law officers of the Crown in England reported a recommendation that the French language should be restored in judicial proceedings and that the old French law should be extended to all civil cases.

Matters rested as they were until the appointment of Gen. Sir Guy Carleton (q.v.) to the post of governor in 1767. The new governor was not long in grasping the situation and in deciding that the restoration of the whole fabric of French civil law would be advisable. To this end he had the *coutume de Paris* of the old régime carefully re-edited by several colonial jurists of acknowledged ability and the revised text at once became the acknowledged source of law in all cases of land tenure and inheritance. Carleton pressed his proposal on the home authorities and in 1770 went to England to urge its adoption. There he managed to secure the appointment of a commission to examine into the merits of the whole matter and the report of this body, although it was not presented until the closing days of 1772, was on the whole in favor of the governor's recommendation. In the meantime, however, there was a growing demand among the British inhabitants of the colony for the establishment of a representative assembly in accordance with the promise made in the proclamation of 1763. At meetings of the British inhabitants resolutions calling upon the home authorities to take steps in this direction were passed and forwarded to England. But to the adoption of such a step there was grave difficulty, namely, the decision of the question as to whether Roman Catholics would be permitted to sit in the new assembly. The disabilities of Roman Catholics had not been removed in England at this time and it was hardly to be expected that Parliament would extend to Roman Catholics in a colony privileges which it denied them at home. On the other hand, an assembly from which Roman Catholics were excluded would be very far from representative in a colony where nine-tenths or more of the population professed that religion. This difficulty, together with the fact that the position assumed by the representative assemblies in the British colonies on the Atlantic seaboard at this time was not calculated to inspire the home authorities with a favorable regard for popular colonial representation, seems to have determined the ministry in its decision that Canada, for the time being, should not be trusted with an assembly representing the people. On some other points, however, the home authorities evinced a desire to meet the wishes of the colonists.

On 2 May 1774 a bill, popularly known as the Quebec Bill, was introduced into the House of Lords where it passed with little opposition. In the House of Commons the measure was vigorously opposed by a strong minority, but with some amendments was eventually passed, and toward the end of June received the royal assent. By the provisions of the act the boundaries of the province of Quebec were extended to include all ancient Canada, including Labrador, and all the territory lying north of the Ohio and west of the Mississippi. Roman Catholics were released from all penal restrictions; the obligation of the tithe was reimposed in favor of the Church, and all classes, with the exception of the religious orders, were confirmed in the full enjoyment of their proprietary rights. French law was hereafter to be applied in *all* civil cases while the law of England was retained for the decision of all criminal causes. Both, however, might be modified by ordinances of the governor and legislative council. Inasmuch as it was «inexpedient to call an Assembly» the act provided for the establishment of a legislative council to consist of not less than 17 nor more than 23 members nominated by the Crown. To this body in conjunction with the governor was given a limited power of internal administration, including the right to levy internal and local taxes. But Parliament expressly reserved to itself the right of external taxation and every ordinance passed by the council was to be transmitted to England where it might be disallowed if the home authorities deemed advisable.

In the New England colonies the passage of the Quebec Act was bitterly resented, partly because of the privileges which it granted a French and Roman Catholic population but more especially because it placed under the almost complete control of the British authorities the vast expanse of territory west of the Alleghanies in the conquest of which the seaboard colonies had borne a heavy share. In Quebec the French inhabitants, while many regretted that provision had not been made for the establishment of a popular assembly open to Roman Catholics, for the most part welcomed the substantial concessions which the act conveyed. There is little doubt that these concessions served in some measure to assure the British authorities of at least their neutrality during the turbulent days of the next few years. The British inhabitants of the province, on the other hand, were naturally disappointed but the course of events during the next half-decade was such as to preclude any important manifestation of their feelings. Under the provisions of the Quebec Act the administration of the province was carried on for the ensuing 17 years.

Bibliography.— Coffin, 'The Province of Quebec and the American Revolution' (1896); Hart, 'The Quebec Act' (1885); Kingsford, 'History of Canada,' passim; Marriot, 'Plan of a Code of Laws for the Province of Quebec' (London 1774); Masères, 'Projet des Lois pour Quebec' (Quebec 1770).

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33. THE ASHBURTON TREATY.

The Ashburton Treaty (also called Treaty of Washington), a treaty between the United States and Great Britain, signed 9 Aug. 1842, is chiefly important for its settlement of the northeastern boundary question. The boundary between Massachusetts (subsequently Maine) and British North America had been in dispute since 1783. The treaty of that year (Art. 2) had made the following provision: «And that all disputes which might arise in future on the subject of the boundaries of the said United States may be prevented it is hereby agreed and declared, that the following are and shall be their boundaries, namely, from the northwest angle of Nova Scotia, namely, that angle which is formed by a line drawn due north from the source of the Saint Croix River, to the Highlands; along the said Highlands which divide those rivers that empty themselves into the river Saint Lawrence from those which fall into the Atlantic Ocean, to the northwesternmost head of the Connecticut River; east, by a line to be drawn along the middle of the river Saint Croix, from its mouth in the Bay of Fundy to its source, and from its source directly north to the aforesaid Highlands which divide the rivers that fall into the Atlantic Ocean from those which fall into the river Saint Lawrence.» The article was doubtless drawn in good faith, but owing to the imperfect knowledge of the geography of the territory concerned, its meaning was soon involved in doubt. The identity of the river Saint Croix, the location of the Highlands referred to and the ownership of the Passamaquoddy Islands became matters of dispute. The identity of the Saint Croix was settled by a commission in 1798, appointed under the treaty of 1794. Under the Treaty of Ghent (see Ghent, Treaty of) (1814) a commission was appointed which settled the Passamaquoddy question by compromise (1817). But the demarcation of the inland boundary seemed long impossible of solution. The American claim located the «northwest angle» at the point where the line due north from the source of the Saint Croix met the Highlands between the rivers flowing into the Saint Lawrence and those flowing into the Atlantic; this established the angle in question «at a place about 144 miles due north from the source of the River Saint Croix, and about 66 miles north of the River Saint John» (United States commissioner, 4 Oct. 1821). The extreme British claim (at any rate after 1814) placed the angle «at or near the mountain or hill called Mars Hill, distant about 40 miles on a due north line from the source of the River Saint Croix, and about 37 miles south of the River Saint John» (note of British commissioner 4 Oct. 1821). In each case the boundary proceeded westward and southward along the Highlands to the head-waters of the Connecticut. Between the two there thus lay a disputed territory of 12,000 square miles. After fruitless negotiations a convention of 27 Sept. 1827 referred the boundary to the arbitration of the King of the Netherlands. His award, however, in 1831 was rejected by the United States.

Meantime the district of Maine had become (1820) a State, and was eager in the defense of its claim to the disputed region. The progress of settlement naturally led to conflict and disturbance on the border line, known as the «Aroostook War.» By the year 1840 matters had reached an apparent deadlock in which the adoption of a conventional line seemed the only solution. In addition to the northeastern boundary, various other matters of controversy were outstanding between the two nations. The English claim of a «right of search» for the suppression of the slave trade created a standing difficulty. The destruction of the *Caroline* (q.v.), an American vessel, by a party of Canadians during the revolt of 1837 had led to a demand for redress. The British government had met this claim by asserting that the destruction of the vessel was a legitimate act of war, the *Caroline* having carried supplies for the insurgents. A Captain McLeod, a Canadian, accused of participation in the affair, was arrested and brought to trial in New York; in all probability nothing but his acquittal prevented actual hostilities. A further complication had arisen in the case of the *Creole*, a slave ship on which the negroes had revolted (1841), and which they had carried to a British port in the West Indies, where they were allowed to go unmolested. There was also in question the boundary of Oregon. To settle these various points at issue, Lord Ashburton (see ASHBURTON, ALEXANDER BARING, LORD) was sent to Washington (April 1842) and in conjunction with Daniel Webster, Secretary of State, arranged the treaty commonly known by his name. Ashburton, formerly Mr. Alexander Baring a prominent financier, and for nearly 20 years a member of the House of Commons, had previously resided in America, where he married a daughter of Senator Bingham. His known desire for a good understanding between Britain and America rendered his relations at Washington most cordial. He was widely entertained, and is said to have "spread a social charm over Washington, and filled everybody with friendly feelings toward England." With Webster his relations were especially amicable, and their negotiations assumed an altogether informal character. (See Schouler, 'History of the United States,' Vol. IV, ch. xvii). To this fact has been partly due the impression ever since prevalent in Canada that the interests of that country were sacrificed to the expansiveness of Lord Ashburton's feelings. Under the terms of the treaty, the northeast boundary was settled thus (Art. I): "It is hereby agreed and declared that the line of boundary shall be as follows: Beginning at the monument at the source of the River Saint Croix, as designated and agreed to by the commissioners under the fifth article of the treaty of 1794 between the governments of Great Britain and the United States; thence north, following the exploring line run and marked by the surveyors of the two governments in the years 1817 and 1818, under the fifth article of the Treaty of Ghent, to its intersection with the River Saint John, and to the middle of the channel thereof; thence up the middle of the main channel of the said River Saint John into the mouth of the River Saint Francis; thence up the middle of the channel of the said River Saint Francis, and of the lakes through which it flows, to the outlet of the Lake Pohenagamook; thence southwesterly in a straight line to a point on the northwest branch of the River Saint John." This locates the main part of the boundary; for details of the further extension of the line, the text of the treaty may be consulted ('Treaties and Conventions,' Washington 1889; 'Annual Register,' 1842). The treaty provided further for the survey and permanent marking of the boundary, which was completed in 1847. Of the disputed territory the United States received about seven-twelfths and Canada five-twelfths. Rouse's Point, on Lake Champlain, was also declared to belong to the United States, the government of that country binding itself to pay to Maine and Massachusetts $300,000 on account of the relinquished territory. The right to carry timber down the Saint John River was granted to the United States. By article 8 of the treaty, it was agreed that each country should maintain on the coast of Africa a sufficient naval force, carrying not less than 80 guns, for the purpose of enforcing, separately and respectively, the laws, rights and obligations of each contracting party for the suppression of the slave trade. The treaty passed over the *Caroline* and *Creole* cases (see CREOLE CASE), but declared (Art. 10) that "each party, on requisition from the other, shall deliver up to justice persons charged with murder, assault with intent to murder, piracy, arson, robbery or forgery, upon sufficient proof of their criminality." The question of the Oregon boundary was also omitted.

The boundary award of the treaty met with great dissatisfaction in Canada. It was currently believed, and the belief largely persists, that the interests of Canada had been unduly sacrificed. The Canadian view of the case is presented in Dent's 'Last Forty Years of Canada' (1881), and in more extreme form in Coffin's 'Quirks of Diplomacy' (1874). The supposed sacrifice of Canada by Lord Ashburton has become a commonplace of Canadian political discussion. Later investigation, however, is strongly in favor of the American claim. The whole subject of the boundary has recently been exhaustively treated in an admirable paper by Dr. William Ganong of Smith College ('Proceedings of the Royal Society of Canada,' 2d series, Vol. VII, 1901). Dr. Ganong, though a Canadian, decides that Maine was right and New Brunswick wrong in the northwest angle controversy. He bases his decision on the text of the treaty of 1783, on the maps of the time, on the admissions of Governor Carlton and others and on a petition of the New Brunswick legislature of 1814, virtually admitting the American claim. The Mars Hill boundary line was not advanced, he says, until 1814. In the controversial discussion of the treaty the episode of the "red line" map has played a considerable part (see *North American Review*, April 1843, and Winsor's 'America,' VII, 180). This was a map found in the French archives and supposed to have been given to Vergennes by Franklin in connection with the treaty of 1783. A boundary line favoring the English claim was marked upon it in red ink. A copy of this map was in Webster's possession during the negotiations but was not shown by him to Lord Ashburton. It was shown by him to the Maine commissioners and played some part in securing their assent to the Ashburton Treaty. But it is not proved that the marking of the map was by Franklin, and it is also possible that it was wrongly marked with intent to deceive (see Hinks, 'Boundaries Formerly in Dispute,' 1885). To offset this map, the original of which has disappeared, there is still in the British Museum an English map favoring the American claim.

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34. CLERGY RESERVES, The. The clergy reserves were lands set apart, by virtue of the Constitutional Act of 1791, for the maintenance of the Protestant clergy in Upper and Lower Canada. The intention of the act was to reproduce in the colony an episcopal establishment similar to that of Great Britain, to whose primate it was to be subordinate. The provincial governors were directed under the act to reserve one-seventh of the land for the support of the Protestant clergy. The reserved blocks of land were to be distributed among those granted to settlers. In Upper Canada a full seventh of all the land was to be granted. In Lower Canada reserves were to be made only in proportion to new settlement and not in respect of lands already occupied. No reservations were made in the latter province until 1796. Reservations were made each year until 1838 (except in 1813). The total reservations made in Lower Canada amounted to over 930,000 acres: in the upper province to about 2,400,000 acres. The Crown was also empowered to authorize the lieutenant-governor of each province from time to time to erect parsonages, to endow them with a portion of the reserve lands and to present incumbents to them (Constitutional Act, Secs. 38, 39, 40). The operation of the system thus established was not at first felt as a serious grievance. Land being still plentiful, the reservations remained unsold and were leased at extremely low rentals (10 shillings for 200 acres during first seven years). With the progress of settlement however the rentals constantly rose. The question of the clergy reserves became a subject of increasing complaint. The members of the Church of England were in a decided minority, not only in the lower province, but in Upper Canada itself. The question early arose whether the wording of the act — «allotment and appropriation of lands for the support of a Protestant clergy» — could not be construed in favor of the Presbyterian and Dissenting denominations. The matter being referred to the home government, the law officers of the Crown decided (November 1819) that the Scotch Church had a claim for a share of the rentals, but that no other denominations had a claim at all. The irritation thus caused rendered the question one of acute difficulty during the succeeding 30 years, and has been designated by Dr. Bryce, the Canadian historian, the «Thirty Years' Religious War in Upper Canada.» The distribution of the population of Upper Canada among the different denominations in 1839 was as follows: Church of England, 79,754; Methodists, 61,088; Presbyterians, 78,383; Roman Catholics, 43,029; Baptists, 12,968; others, 57,572. The claims of the Church of England were stoutly upheld by the Rev. John Strachan, subsequently bishop of Toronto (1839). Egerton Ryerson (see RYERSON, A. E.), a young Methodist minister, strove with equal zeal on behalf of the Methodist Church.

In 1827 the assembly of Upper Canada asked the Crown to devote the reserves to the creation of schools and of churches of all denominations. The same request was repeated in each of the three following years with considerable popular agitation. Meantime the endowment of rectories as provided by the act of 1791 was authorized by instructions from the Crown in 1825. The excited state of public feeling delayed for some years the execution of this project, but in 1836 54 rectories were endowed with 400 acres each. The discontent thus caused helped to precipitate the rebellion of 1837. With the suppression of that movement the question of the clergy reserves still earnestly demanded solution. An act of the legislature of Upper Canada in 1839, proposing to reinvest the reserves in the Crown, was disallowed by the home government. In the following year the legislature passed an act for the sale of the reserves, one-half of the proceeds to go to the churches of England and Scotland, and the other to be divided among the other religious denominations. This again was abortive, the British judges, on question by the House of Lords, deciding that the provincial legislature had exceeded its authority. The Imperial Parliament now intervened and passed an act (7 Aug. 1840) for the settlement of the question. Part of the reserves had already been sold by authority of a statute of 1827. The proceeds of these sales were to be divided between the churches of England and Scotland, the former receiving two-thirds; the unappropriated lands (1,800,000 acres) were to be sold, and the amount realized to be invested, one-half of the interest being given to the two above churches, in the proportion already mentioned, the other half to be applied by the governor and executive council for public worship and religious instruction. The income thus accruing was divided in the ensuing years among the churches of England and Scotland, the Wesleyan Methodist, Roman Catholic and Synod Presbyterian churches and the United Synod Presbytery. The question was still far from settled. It was claimed that the lands were sold by the Crown at insufficient prices, and Bishop Strachan led an agitation for the sharing up of the lands themselves. The assembly refused to petition the Crown to this effect, but demanded the repeal of the act of 1840. The Imperial Parliament complied by a statute of 1853, which placed the reserves in the control of the provincial Parliament (the two Canadas being now united). The Canadian Parliament elected in 1854 strongly reflected the general public feeling in favor of secularization. A statute to that effect was passed. A lump sum of £188,342 was paid to the Church of England, representing the guarantee of stipends then charged on the reserve fund, called for by the Imperial act. The reserved lands were sold and the proceeds given to the municipal authorities for education and local improvement. Consult Lindsay, 'The Clergy Reserves' (1851); 'Memoir of Bishop Strachan' (1870); Ryerson, 'Story of My Life' (1883).

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35. SEIGNIORIAL TENURE. The system of Seigniorial Tenure was that system of public and private relations based upon the tenure of land which the French government undertook, during the course of the 17th and 18th centuries, to introduce into its North American colonies, and more especially into the colony of New France, now Canada. The system of feudal — or as in its later stages it came to be called — seigniorial tenure, was deeply rooted in France, and it is easy to understand how its introduction into the colonies appealed to Richelieu as a means of providing estates for many of the landless aristocrats of France. Moreover as feudalism was now so far advanced in decay as to be no longer a menace to the central power, it is easy to see how the system appealed to the Bourbon monarchs as likely to permit, in the colonies, of that centralization of authority which characterized France at this time.

As regards Canada, the seigniorial system had its origin in 1627 when the French King granted to the Company of New France, more commonly known as the Company of One Hundred Associates, the whole of the French possessions in North America as one immense fief with full power to sub-grant it in seigniories to settlers. During the whole 35 years of its existence, however, this company devoted almost its entire attention to the development of the lucrative fur trade; very few settlers were sent out to the colony, with the result that while over 60 *in extenso* grants of seigniories were made, almost none at all were ever taken possession of by the grantees. But in 1663 the company was compelled to surrender its charter and extensive territorial rights, the Crown taking into its own hands the supervision of colonial affairs and providing New France with a royal government corresponding roughly to that established in the French provinces at home. From this time on settlers came in increasing numbers; power was given the colonial governor and intendant to make grants of seigniories subject to royal ratification, and during the last quarter of the 17th century these were made freely. In no case were grants made to absentees; each applicant for a seigniorial grant had to prove himself a bona-fide colonist. Large numbers of the settlers were sent over at the royal expense and once in the colony, every inducement was given them to remain. Even the detachments of French regular troops sent out to the colony were disbanded there and both officers and men were encouraged, by liberal grants both of land and money, to become permanent residents of New France.

As to the size of the seigniories granted, there was no fixed rule: they varied from small plots containing a few square *arpents* to huge tracts 10 by 12 leagues in area. Much depended on the position occupied by the settler before his immigration to the colony and upon the available means which he had for the development of his grant. But whatever the area of the grants, they almost invariably assumed the same shape,— that of a parallelogram with the shorter end fronting on the river. On receiving his grant the new seignior was under obligation to repair at once to the Château de Saint Louis in Quebec, there to render his fealty and homage to the governor as the representative of the Crown. Within the next 40 days he was required to file with the registrar-general his *aveu et dénombryment*, or statement showing clearly the location, extent and nature of his seigniory. A similar statement containing full information regarding the development of the holding was required every time the seigniory changed owners. No payment was exacted from the seignior in return for the original grant, but an exaction known as the *quint* became payable on each mutation of ownership by sale, gift or inheritance other than in direct succession. This amounted to one-fifth of the estimated value of the seigniory, but of this amount it was the custom of the Crown to give a rebate of one-third. As the seigniories increased in value very slowly this burden was never an onerous one. In making the grants, the authorities usually reserved the right of taking, from the granted seigniories, such locations as might at any time be found necessary for the construction of fortifications or other public works, such oak and pine timber as might be found suitable for use in the royal shipyards and the right to a share in all mines and mineral deposits found in the seigniory.

In France the seignior was under no obligation to sub-grant the lands within his seigniory, but by a series of royal edicts,— more notably the Edict of Marly (1711), this obligation was imposed upon the seigniors of New France in the interest of colonial development. From 1711 onwards it was incumbent on all seigniors in Canada to sub-grant portions of the unoccupied lands of their seigniories to any settlers who applied for such grants, on whatever terms were customary in the neighborhood without exacting any bonus or *prix d'entree*. If the seignior refused to do this, power was given the governor and intendant to step in and to make the grant, the seigniorial dues in such case to become payable to the Crown. Furthermore, from time to time various edicts revoked or curtailed the grants made to such seigniors as did not seem to be showing sufficient zeal in having their lands granted to settlers. In this way every seignior was compelled to become, after a fashion, the immigration agent of the colonial authorities, and it was this particular feature which serves most prominently to differentiate the seigniorial system in Canada from its prototype at home.

Grants made by the seigniors to settlers were called grants *en censive*. These likewise varied considerably in size, but almost invariably assumed the same shape as the seigniory within which they lay. Over them the seignor retained a variety of rights, some financial, some judicial and some merely ceremonial or honorary in their nature. Among the former was the annual payments known as the *cens et rentes*, the former payable in money, the latter usually in produce. The *cens* was a very small due, amounting usually to a few *sous* per superficial *arpent* and valuable to the seignior mainly as establishing his claim to other and more important rights. The *rentes* was payable annually in grain, cattle or poultry but might be commuted by agreement of the parties into a fixed money payment. Then there was the *lods et ventes*, a mutation fine payable at every change of ownership. This amounted to one-twelfth of the mutation price, and of it the seignior usually remitted one-fourth, although he was under no legal obligation so to do. To guard himself against loss of his proper *lods et ventes* through sales of *en censive* holdings at less than their actual value, the seignior possessed the *droit de retraite* by virtue of which right he might preempt any holding thus sold by payment to the purchaser of the mutation price, within 40 days from the date of the sale. Then there was the *droit de banalité* or the exclusive right of the seignior to erect a grist mill within the limits of his seigniory and to compel his *censitaires* to have their grain ground there and not elsewhere on pain of confiscation. The amount of toll receivable for this service was fixed by a royal edict at one-fourteenth of the grain ground. During the greater part of the French régime this incident bore more heavily upon the seignior than upon his *censitaires,* for except in the more populous seigniories, the amount of toll received rarely sufficed to pay expenses. At the same time the colonial authorities compelled the seigniors to provide mills in their seigniories on pain of losing the right for all future time. Finally, there was the much-detested *corvée,* or right of the seigniors to exact from their *censitaires* a certain quota of labor on the seigniorial lands without compensation. The amount allowable varied in different seigniories but as a rule the *censitaires* were permitted to commute it into a fixed money payment. An ordinance of the superior council in 1716 forbade the exaction of *corvée* during seed time and harvest. In addition to the foregoing main rights the seignor ordinarily reserved for himself the privilege of taking from the lands of the *censitaires* such wood and stone as might be found necessary in the erection of the seigniorial manor house, mill or church, and in some cases the right of taking wood for fuel. In many cases he likewise reserved the right of claiming a share in all the fish caught by his *censitaires* in the waters of the seigniory.

Most of the seigniors possessed certain judicial rights. These, however, were not inherent in the ownership of a seigniory, but were specifically granted by the Crown. This grant might convey merely the right of *basse justice* in which case the seignior was empowered to deal with minor causes in which the amount in dispute did not exceed a few *sols.* The grant of *moyenne justice* gave him a large jurisdiction, while the grant of *haute justice* gave full judicial power in all cases except those such as treason and counterfeiting in which the Crown was directly concerned. As a rule all three degrees of judicial power were conferred on the seignior. But in every case an appeal lay to the royal courts of the colony. As the exercise of his judicial powers brought the seignior very little profit the seigniorial courts never became a very important element in the colonial judicial system.

The remaining rights of the seignior were merely honorary and afforded him no financial return. He was entitled to the fealty and homage of his *censitaires,* to a front pew in the parish church, to certain precedence at the sacraments, to the erection of a Maypole at his door each Mayday and, in general, to the respect and deference of his dependents. A number of seigniors who showed zeal in the development of their holdings received patents of nobility but it must be borne in mind that the possession of a seigniory in New France did not of itself give noble rank. Herein Canadian feudalism again differed from its prototype in France. The French seignior was always a noble; the Canadian very rarely.

At the close of the French régime nearly 8,000,000 *arpents* of land had been granted out to be holden under the seigniorial tenure. The system had become so deeply rooted in the colony that the English authorities, after the conquest, did not venture to take the drastic step of supplanting it in favor of the English system of tenure in free and common socage. The old system was allowed, therefore, to remain intact, but as the colony became more thickly settled many of the seigniorial exactions became burdensone. The *droit de banalité* became especially so. Moreover, the new English courts failed utterly to afford the *censitaires* that protection against the seigniors which the authorities of the old régime had given. From time to time the legislature of Lower Canada sought to deal with the growing complaint that the operation of the system was retarding the development of the province but found it extremely difficult to devise any plan which would be satisfactory to the tenants and at the same time protect the vested interests of the seigniors. In 1825 an act was passed giving to the parties concerned the right to commute all seigniorial dues into a lump sum by mutual agreement but very few took advantage of the legal permission thus accorded. It was not until 1854 that by the Seigniorial Tenures Abolition Act a general scheme for the compulsory commutation of all seigniorial obligations received the assent of the Canadian legislature. This act provided for the establishment of a special court to determine just what seigniorial claims were justifiable and on a basis of its decisions each seignior was awarded a certain indemnity for the loss of his rights. Part of the amount was paid him from the public treasury; the balance became an annual rent charge on the lands of the tenants, which annual charge, again, might be commuted into a lump sum if the tenant so desired. In any case all lands formerly holden *en seigneurie* or *en censive* were thereafter to be holden in fee simple. Thus by one stroke of legislation the whole system of territorial law in Lower Canada was revolutionized and the last vestige of Canadian feudalism disappeared.

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36. HUDSON'S BAY COMPANY, The.*

This great trading company has been in operation under its present charter for two and one-third centuries. Its charter, which is a very generous one, was given by easy-going Charles II. The company owes its origin to the adventures in the New World of two French Huguenots, Pierre Esprit Radisson and Medard Chouart (afterward Sieur de Groseilliers, or familiarly "Mr. Gooseberry"). It is claimed that in 1662 these daring spirits reached James

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* The charter of this company is given to the "Governor and Company of Adventurers of England trading into Hudson's Bay." From this it has been usual to employ the title "Hudson's Bay Company," using the possessive form of the name of Hudson, the discoverer. The bay itself, as in the case of Hudson River, has its name spelt by the geographers without the apostrophe and s.

Bay, the southern lobe of Hudson Bay. This is entirely improbable, as in that year they are known to have been in Lac des milles Lacs, now northern Minnesota. (See the discussion on this matter in the author's 'Remarkable History of the Hudson's Bay Company'). Persecuted in French Canada, the adventurers fled to New England and thence to England, where they had an audience with the King, and through the influence of Prince Rupert (see RUPERT, PRINCE), the King's cousin, a strong company was afterward formed, being created by royal charter. The first expedition to Hudson Bay was made for the adventurers in the ship *Nonsuch Ketch*, Capt. Zachariah Gillam, a New England mariner. Arrived at the destination, a fortress was erected on James Bay (lat. 51° 20′ N., long., 78° W.), called Charles Fort. On the return of the vessel to England the charter was granted (1670). Prince Rupert was made the first governor, and the vast territory covered by the charter became known as Rupert's Land. He was followed by the King's brother, James, Duke of York, and the third governor was the famous Duke of Marlborough, who has left his family name on Fort Churchill. England's great rival, «La Belle France,» immediately began to lay claim to the bay as a part of Canada. Several expeditions were sent out to drive off the English, the most notable being that under Pierre Le Moyne d'Iberville. (See IBERVILLE, PIERRE LE MOYNE D'.) He achieved so great a naval victory that the whole bay fell into French hands, comprising at that time seven forts, of which Charles, Nelson, Moose and Albany were the chief. The territory under dispute was restored to England by the famous Treaty of Ryswick, 1697. Up to the time of the French forays rich dividends had been declared by the partners, that of 1690 being 75 per cent of the original stock, and the King's share was rendered in guineas instead of pounds. The company, which included many distinguished men such as the Duke of Albemarle (General Monk), (see MONK, GEORGE), and Sir George Carteret (see CARTERET, SIR GEORGE) was very influential. Prince Rupert presided at the London meetings, and a subcommittee met regularly to buy and sell, went to Gravesend to see the goods shipped, the men paid, and the like, in the good ships *Prince Rupert, Wyvenhoe*, or *Bark Craven*, which sailed around the north of Scotland and thence to Hudson Bay. Every year, about 1 June, for more than 200 years, one ship at least has cleared for its northern port on the bay, latterly generally York Factory. How small the beginnings of trade were may be seen in the inventory of goods sent out in 1672: «Two hundred fowling-pieces, and powder and shot; 200 brass kettles, size from 5 to 16 gallons; 12 gross of knives; 900 or 1,000 hatchets.» In October the ship returned with its valuable cargo of furs, which was sold in London, often by auction.

The second period of Hudson's Bay Company history is that involving the local opposition in England to the traders. Between the treaties of Ryswick (1697) and Utrecht (1713), the menaces of the French destroyed the fur trade, but after the latter treaty, from which time the bay has remained continuously English, the affairs of the company improved. This roused the envy of a number of merchants, a leader among them being an Irish gentleman named Arthur Dobbs. He advocated an expedition to explore the Northwest Passage, raised by subscription a large sum to send out a ship to rival the company, and though his expedition did not accomplish much, yet the Hudson's Bay Company was disturbed, was put on its mettle, and the struggle as recorded in the government bluebook of 1749 became very interesting. A more serious movement, however, began in French Canada. The charter of the company gave it the trade of all the lands and streams within «Hudson's Streights,» with one most important limitation, namely, except those «which are not now actually possessed by any of our subjects, or by the subjects of any other Christian prince or state.» Long before the Hudson's Bay Company penetrated Rupert's Land, the French ascended the Great Lakes, and 20 or 30 years before the English had reached the Saskatchewan River from Hudson Bay explored the river system of Rupert's Land and came in sight of the Rocky Mountains. This feat was accomplished by Sieur de la Verendrye, who in 1738 caused a fort to be erected on the site of the present city of Winnipeg, and took possession of the country for the King of France. The conquest of Canada by Wolfe put an end to this French occupation, but as later discussions show left it a part of Canada. Soon after the conquest of Canada, however, a critical movement took place in the effort of the Hudson's Bay Company to penetrate the interior from the bay, on whose shores for nearly a century it had lain in slumber. This advance was under the leadership of one of the captains of exploration, Samuel Hearne, a Hudson's Bay Company officer, sometimes called the «Mungo Park of Canada.» Hearne discovered the Coppermine River and followed it to its mouth on the Arctic Sea. He, too, first of white men saw Great Slave Lake. But, also, shortly after the transfer of Canada from France to England, Scottish traders from Montreal began to ascend the waterways of Canada, and to pass from Lake Superior on to Lake Winnipeg and the Saskatchewan River, the very centre of Rupert's Land. Alexander Henry (1760), Thomas Curry, James Finlay and the brothers Frobisher, traders from Montreal, led the way and reached the Saskatchewan. Hearne from Hudson Bay heard of the Canadian traders having built a fort at Sturgeon Lake, and two years later (1774) accepted the gage of battle, and built Fort Cumberland alongside of his rivals on the Saskatchewan. The war of the giants had now begun, and for well-nigh 50 years it raged with increasing rancor and bitterness. Out of the movement of the Scottish merchants named, from Montreal, grew the union of traders (1783–84) known as the Northwest Company. Its leading traders were Frobisher, Mackenzie, McLeod, McGillivray, Grant, Cameron and greatest of all Simon McTavish — familiarly called «Le premier,» and the founder of the Northwest Company. The magnates of this great company Washington Irving has characterized as the «Lords of the Lakes and Forests.» Their trade was enormous and extended to the coast of the Pacific Ocean itself. Toward the end of the century (1795–99) one year's production of furs was 106,000 beavers, 32 martens, 11,800 mink, 17,000 musquash — counting altogether 184,000 skins. At this time the Northwest Company employed, besides officers and partners, 50 higher clerks, 71 interpreters and clerks, 1,200 canoemen and 35 guides. But the Hudson's Bay Company was not to be beaten. They were able to carry goods from the seacoast of Hudson Bay to the inland parts of Rupert's Land earlier in the season, even in the Red River districts, than the Nor'-Westers were able to do by the long river and lake route from Montreal. They duplicated all the forts of the Northwest Company. The confusion became worse confounded when the Northwest Company divided (1796) into two rival factions, the rebels forming themselves into the «New Northwest Company» or «Alexander Mackenzie and Company,» more familiarly, however, known as the «XY,» the name being from the letters of the alphabet following the initials of the old company N.W. The young company was intensely active, and about this time, but only for a short period, the introduction of dangerous amounts of strong drink took place among the Indians. After eight years of unprofitable trade the two sections were reunited as the «Northwest Company.»

Early in the 19th century a new problem arose. A Scottish nobleman, the Earl of Selkirk, obtained control of the stock of the Hudson's Bay Company and proceeded to settle up the fertile lands along the Red River, bringing his colonists chiefly from Scotland by way of Hudson Bay. This invasion of the fur-country (1812–15) by farmers the Nor'-Westers strongly resented. They several times drove out, or inveigled away many of the Highland settlers, who were beginning to till the soil within two or three miles of the site of the present city of Winnipeg. Two forts represented the opposing parties — Fort Gibraltar, the Northwest Company fort — Fort Douglas, the Lord Selkirk stronghold. The descendants of the Nor'-Wester French voyageurs, whose mothers were Indian women, were now becoming numerous and went by the name of Metis (Half-breeds) or Bois-Brûlés (Charcoal faces). They were chiefly in the employ of the Montreal Company, while the servants of the Hudson's Bay Company, largely Orkneymen, were called by their opponents «Les Orcanais.» Attacks on the forts were begun by the hostile factions, and in 1816 Governor Semple and 20 of his officers were killed by the Bois-Brûlés, and Fort Douglas was captured. In the next year Lord Selkirk arrived supported by a band of several hundreds of discharged mercenary soldiers who had fought in the War of 1812–15 in eastern Canada. These his lordship had hired and with their aid Fort Douglas was retaken and the colonists re-established in their farms. About the year 1811 John Jacob Astor of New York engaged a number of men who had been in the Northwest Company and with these established Astoria, a trading post, on the Columbia River. This movement took place by way of the Cape Horn route and the rendezvous was in what was known as the Oregon region. The Nor'-Westers taking advantage of the state of war between Great Britain and the United States seized Astoria and employed the greater number of the Astorians in their posts in New Caledonia, as the region of British Columbia was then called. The conflicts of the various companies in different parts of Rupert's Land, the Mackenzie River district and New Caledonia well-nigh destroyed the fur trade. Now arose a man who was to be the pacificator and leader of all the fur-traders. This was a young Scottish clerk in the Hudson's Bay Company — George Simpson (see SIMPSON, SIR GEORGE). On the union of the worn-out companies in 1821, Simpson was made chief officer and in time he became «Emperor» of the fur company. For 40 years he built up the united company, and spent a portion of his time at Fort Garry, the chief point in Rupert's Land, as it was also the capital of Assiniboia, as the Selkirk colony was legally called. In Assiniboia a community of 12,000 grew up, 5,000 Metis, 5,000 English-speaking or locally called Scotch half-breeds, and some 2,000 whites. Not only in this chief settlement, but from Labrador in the Atlantic Ocean to Vancouver Island on the Pacific did the little despot rule. Great forts were scattered over this wide domain, such as Fort Victoria on the Pacific shore, Fort Simpson in the Mackenzie River district, Fort Chipewyan on Lake Athabasca, Fort Edmonton on the Saskatchewan River, old Fort Cumberland on the same river, Norway House on Lake Winnipeg, York Factory and Fort Churchill on Hudson Bay, Fort William on Lake Superior, Sault Sainte Marie, between Lakes Huron and Superior, the King's post on the lower Saint Lawrence River, and Rigolette in extreme Labrador. From Lachine, his residence, Sir George Simpson dictated law throughout this vast extent of country, and compelled order and industry. The company quoting its charter-rights was from the first repressive in dealing in its territory with traders other than its own. The usual metaphor for describing Rupert's Land was that it was «surrounded by a Chinese wall.» After a revolt of the Metis in 1849 this largely ceased to be the case. The company always retained the confidence of the Indians, and with practically no police or military maintained a fair state of law and order. The fertile plains of Rupert's Land were visited by several exploratory expeditions shortly after the middle of the 19th century. Some of these were that of Palliser and Hector, 1857, of H. Y. Hind in the same year and of Milton and Cheadle a few years afterward. A famous parliamentary investigation took place in London in the year of Palliser's expedition. Canada was at this time becoming alive to the importance of the Northwest. Negotiations took place between the British and Canadian governments which culminated in 1868–70 in the virtual decision that Rupert's Land, and the Northern and Western territories which were leased to the Hudson's Bay Company, should become Canadian. Unskilful dealing on the part of the Dominion government with the people of Red River Settlement led, however, to the Riel rebellion, 1869–70. A military expedition of British troops and Canadian volunteers was sent by the old fur traders' route to Red River, but the rebels disappeared before the arrival of the troops. In 1870 the sum of $1,500,000 was paid by Canada to the Hudson's Bay Company to satisfy its claims, the new province of Manitoba was formed by the Canadian Parliament, and thenceforward the West as far as the Rocky Mountains became a part of Canada. Several years afterward British Columbia came into the Dominion as a province.

The Hudson's Bay Company, though shorn of all political power, still survives, and is vigorous. It still seeks for furs in the far North, and is the largest land company in Canada, owning one-twentieth of every new township, which the government surveys. This serves to give the Hudson's Bay Company a strong interest in building up and developing the newer portions of the country. In addition to this the company has largely devoted itself to conducting large shops in the leading business centres of western Canada. The largest of these is the store in Winnipeg. This with its different departments does an enormous trade not only in Winnipeg, but in supplying by the use of the mails the needs of all parts of the country. Important stores are maintained by the company in Portage la Prairie, Rat Portage, Fort William, Calgary, Vancouver, Edmonton and Prince Albert. The governor of the Hudson's Bay Company till 1914 was the predominating figure, Lord Strathcona, the Canadian commissioner in London. As the writer has elsewhere said, “for the last 15 years the veteran of kindly manner, warm heart, and genial disposition, Lord Strathcona and Mount Royal (q.v.), has occupied this high place. The clerk, junior officer and chief factor of 30 hard years on the inhospitable shores of Hudson Bay and Labrador; the commissioner who, as Donald A. Smith, soothed the Riel rebellion, and for years directed the reorganization of the company's affairs at Fort Garry and the whole Northwest; the daring speculator who took hold with his friends, of the Minnesota and Manitoba Railway, and with Midas touch turned the enterprise to gold; a projector and a builder of the Canadian Pacific Railway; the patron of art and education, and the patriot who sent out at a cost of between $1,000,000 and $2,000,000 the Strathcona regiment of horse to the South African War has worthily filled the office of governor of the Hudson's Bay company, and with much success reorganized its administration and directed its affairs.” See also the articles The Era of Early Discovery; and Commerce, Tariffs and Transportation.

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37. WASHINGTON TREATY, The.

The Treaty of Washington, between the United States and Great Britain, was signed on 8 May 1871, and had reference to the Alabama claims (q.v.), the fisheries question, the lake, river and canal navigation, the bonding privilege and the Vancouver water boundary question. In the years immediately following the Civil War several causes of acute friction existed between the two countries. Of these the principal was the question of indemnity for the depredations committed by the *Alabama* and other Southern cruisers, whose construction in England was claimed by the United States to be a violation of neutrality. The second main cause of contention was the question of the coast fisheries. Under the Reciprocity Treaty of 1854, the fishermen of each nation were admitted to the inshore coast fisheries of the other. With the expiration of the treaty in 1866 the rights of American fishermen on the Atlantic Coast of Canada were limited to the privileges secured under the convention of 1818, with a modification of 1845 admitting them to the Bay of Fundy. By this they were excluded from taking fish within three marine miles of any coasts, bays, creeks or harbors of British North America, except in special parts of the Newfoundland and Labrador coast, and off the Magdalen Islands. The proper interpretation of this three-mile limit had been a standing subject of controversy. It was claimed by Great Britain that the terms of the treaty precluded entrance into the bays: by the United States that it merely forbid a nearer approach to the shores of the bay than a distance of three miles. This left in dispute the right to fish in the Bay of Chaleurs and other important places. (See Cushing, ‘Treaty of Washington,’ ch. v). As a temporary expedient since 1866, the Canadian government had sold licenses to American fishermen for a nominal fee. This scheme had proved abortive, for the raising of the license fee in 1868 had resulted in an almost complete cessation in their use, only 25 being taken out in 1869. The Dominion government, in consequence, by an order in council (8 Jan. 1870) abandoned the system of licenses and equipped cruisers to protect its claims of the coast fisheries. The *Alabama* claims and the fisheries had been for some time a standing subject for negotiations. A treaty of January 1869 (known as the Johnson-Clarendon Treaty) was rejected by the Senate. Negotiations were renewed under President Grant and, at the suggestion of the British government, it was finally decided to appoint a joint high commission to meet at Washington to settle outstanding matters of dispute. The commissioners for the United States were Hamilton Fish, Secretary of State; Gen. Robert Schenck, Judge Nelson of the Supreme Court, Ebenezar Hoar and George H. Williams. The British commissioners were Lord de Grey, Sir Stafford Northcote, Sir Edward Thornton, Prof. Montague Barnard and Sir John Macdonald, Prime Minister of Canada. Their deliberations lasted from 27 Feb. until 6 May 1871. Of the different points in the treaty agreed upon the most important is that in reference to the *Alabama* claims, on account of its bearing upon international law. The matter at issue here was the extent to which Great Britain had been guilty of a breach of neutrality. The *Alabama* had been built in Birkenhead. The purpose of her construction had been a matter of general notoriety. The British government had refused to listen to any representations that fell short of being technical evidence. Even when the American consul at Liverpool furnished the needed proof, the dilatory action of the government permitted the cruiser to depart unmolested. The question was whether, in reference to the *Alabama* and other Confederate cruisers, the government of Great Britain had shown the diligence demanded of a neutral power (see 42d Congress, 2d Sessn. Senate Exec. Doc. 31 November, pp. 146–51). The commission decided that the claims thus arising “shall be referred to a tribunal of arbitration to be composed of five arbiters,” one to be named by the President of the United States, one by Her Britannic Majesty, one by the King of Italy, one by the President of the Swiss Confederation and one by the Emperor of Brazil. The questions considered were to be decided by a majority. Article 6 of the treaty declares: «In deciding the matters submitted to the arbitrators they shall be governed by the following three rules, which are agreed upon by the high contracting parties as rules to be taken as applicable to the case, and by such principles of international law not inconsistent therewith as the arbitrators shall determine to have been applicable to the case: A neutral government is bound: First, to use due diligence to prevent the fitting out, arming or equipping, within its jurisdiction, of any vessel which it has reasonable ground to believe is intended to cruise or to carry on war against a power with which it is at peace; and also to use like diligence to prevent the departure from its jurisdiction of any vessel intended to cruise or carry on war as above, such vessel having been specially adapted, in whole or in part, within such jurisdiction, to warlike use. Secondly, not to permit or suffer either belligerent to make use of its ports or waters as the base of naval operations against the other, or for the purpose of renewal or augmentation of military supplies or arms, or the recruitment of men. Thirdly, to exercise due diligence in its own ports and waters, and, as to all persons within its jurisdiction, to prevent any violation of the foregoing obligations and duties.» The tribunal thus arranged met at Geneva (December 1871) and in September 1872 rendered its decision «that the British government had failed to use due diligence in the performance of its neutral obligations,» and awarded an indemnity of $15,500,000 to the United States. In regard to the fisheries, the treaty practically re-established the status under the Reciprocity Treaty of 1854, throwing open the inshore fisheries of the Atlantic Coast north of latitude 39° to the fishermen of both nations (Art. XVIII, XIX). It also established reciprocal free trade in fish and fish oil (Art. XXI) and decided that commissioners should be appointed to determine what extra compensation, if any, should be paid by the United States for the privileges thus acquired. A compensation of $5,500,000 was subsequently awarded by the Halifax Fisheries Commission (1878). The location of the northwestern boundary (see NORTHWEST BOUNDARY DISPUTE) which under the treaty of 1846 was declared to follow the 49th parallel «to the middle of the channel which separates the continent from Vancouver's Island and thence southerly through the middle of the said channel and Fuca Straits to the Pacific Ocean,» was left (Art. XXXIV) to the decision of the German Emperor. It was further agreed (Art. XXVI) that the navigation of the river Saint Lawrence shall forever remain free and open for the purpose of commerce to the citizens of the United States. The United States in return declared the Yukon, Porcupine and Stikine open to British commerce (Art. XXVI), granting also to British subjects the right of navigating Lake Michigan, the use of the Saint Clair Flats Canal on terms of equality with inhabitants of the United States. The bonding privilege (Art. XXIX) was mutually conceded. The fisheries provisions were not to go into effect until the «laws required to carry them into operation» should be passed by the British and Canadian Parliaments, the legislature of Prince Edward Island and the Congress of the United States. The entire treaty was to remain in force for 10 years, after which certain articles — the fisheries arrangement, the right of navigating Lake Michigan and the bonding privilege — might be terminated on two years' notice from either party. The fisheries clauses of the treaty were subsequently renounced by the United States, and after due notice expired 1 July 1885. For further details the work of Cushing (mentioned above) may be consulted. The text of the treaty is in 'Treaties and Conventions of the United States' (1889). For the part played by Sir John Macdonald (q.v.) in the negotiations and their relation to Canadian politics, see Pope, 'Memoirs of Sir John A. Macdonald,' Vol. II, ch. xix-xxi.

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38. JESUIT ESTATES ACT. This measure, passed by the legislature of Quebec in 1888, gave rise to an agitation which occupied public attention throughout all parts of Canada during the following year and for a time threatened to bring about a reconstruction of political parties. Under the French régime, which ended in 1763, the Jesuits had owned considerable landed estates at various points in the valley of the Saint Lawrence — particularly at Quebec, Montreal and Laprairie. After the conquest of Canada by the English the religious orders were permitted to retain the property which they held under grant from the French Crown or by other legal title, with the exception of the Jesuits. This order had been banished from France, 1767, and was suppressed generally by the papal brief *Dominus ac Redemptor* (1773). Although General Amherst brought influence to bear upon the government to secure for himself the estates of the Jesuits in Canada, his efforts proved unsuccessful. Despite personal pressure and the papal brief the «black robes» at Montreal and Quebec were not immediately molested by the British authorities who refrained from taking over their property until the death of Father Casot, the last remaining member of the Society. This event occurred in 1800. Once possessed of the Jesuits' estates the Crown had to determine what should be done with them, and after a certain amount of indecision it was decided that their income should be used for the support of education in the province of Lower Canada. In vain the Roman Catholic bishops maintained the legality of the Church's claim to the property. The government stood its ground and appropriated the revenues.

From having been originally assigned to Lower Canada, the Jesuits' estates passed at Confederation (1867) into the hands of the province of Quebec. It was found, however, by the local government that their actual value was impaired by the ecclesiastical claims which stood against them. The bishops did not cease to protest against their retention by the state and the Jesuit order, revived under papal warrant, defended the justice of its own title. Had these lands been situated in a Protestant community the representations of bishops and Jesuits might have carried little weight, inasmuch as they could not be vindicated by an appeal to the courts, but where the mass of the population was Catholic the reiterated claims of the Church had their effect upon the market. After Confederation the rent of the property decreased until it became almost negligible in comparison with the valuation, and when the government sought to effect a sale no purchaser could be found. In 1887 after the question had been put off by several preceding administrations, Mr. Mercier, a French Nationalist of pronounced views, endeavored to effect a final settlement of it. Whatever the motives which actuated him, to criticize them would be to raise a matter of opinion. He introduced a bill which gave $400,000 to the Roman Catholic Church as compensation for the property which the Crown had seized in 1800. This sum was, for the moment, to constitute a special deposit which eventually should be distributed by the Pope in return for a relinquishment of all claims to the Jesuits' estates that had been advanced by the bishops or by the Jesuits themselves. As a matter of fact the Pope divided the money between the Jesuits, the bishops and Laval University, but in the meantime this recognition of his right to allot what were considered public funds among members of his own Church drew forth cries of remonstrance from a large number of Protestants. A simultaneous grant of $60,000 to Protestant schools in Quebec did not allay the feeling of hostility.

It should be observed that two distinct questions were raised by the agitation which proceeded from the Jesuits' Estates Act. The first had its root in the opposition of religious systems; the second was due to Federal character of the Canadian constitution. In 1888, Colonel O'Brien, a Protestant member of the House of Commons, proposed that the Dominion Parliament should disallow the action of the Quebec legislature in appealing to the Pope and setting aside $400,000 as a subsidy to Roman Catholic institutions. The debate which followed was marked by a series of able and aggressive speeches from all quarters of the House. The chief supporter of Colonel O'Brien's motion was Mr. Dalton McCarthy, while against him were ranged the Premier, Sir John Macdonald, and Mr. Laurier, the leader of the Opposition. On the one side an appeal was made to the alleged political misdeeds of the Jesuits throughout the whole course of their history and to their expulsion from the chief countries of the civilized world. On the other, it was maintained that the Dominion Parliament could not, without extreme danger, disallow provincial legislation and that «the subject-matter of this act was one of provincial concern, only having relation to a fiscal matter entirely within the control of the legislature of Quebec.» The vote of 188 to 13 against Colonel O'Brien's motion conveys but a faint idea of the public interest in this debate and in the issues which lay behind it. The fundamental claim of the extreme Protestant party was that recognition of papal authority and the encouragement of the Jesuits were direct blows at British freedom; while the leaders of both parties united to point out the constitutional dangers which would accompany disallowance.

Outside the House of Commons the agitation caused by the Jesuits' Estates Act led to the formation of an «Equal Rights» party which was recruited from the ranks of the more pronounced Protestants. It proved impossible, however, to break down existing political lines by giving central importance to an anti-Catholic movement. Despite many public meetings and an active campaign in the newspapers, the attack upon the Jesuits' Estates Act has left no lasting trace upon party organization in Canada.

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39. AGRICULTURE. At least half of the population of Canada is directly or indirectly dependent upon agriculture, the chief industry of the Dominion. During the present century agricultural development in Canada has been extremely rapid, and although violent dislocations were caused by the European War there are indications that after the conclusion of peace a new period of rapid agricultural expansion will begin.

Political Boundaries.— Extending westward from the Atlantic to the Pacific and northward from the United States boundary into the Arctic circle, Canada, in size, embraces a total area computed at 3,729,665 square miles, of which 125,755 square miles are water. Politically, Canada is divided into nine provinces, in addition to which there are the Northwest and Yukon territories. Each province has control over its own affairs. Agricultural conditions vary with climate and physical characteristics, density of population, accessibility of markets and special aptitudes of the people. In 1912 took place the latest adjustment of the provincial boundaries when by act of the Dominion Parliament portions of the Northwest territories were added to the provinces of Manitoba, Ontario and Quebec. The effect was to extend the province of Manitoba northward to the 60th parallel of north latitude and the southern shores of Hudson Bay, to extend the northern limits of Ontario to Hudson Bay and to throw into the province of Quebec the whole of the huge territory of Ungava and Labrador with the exception of that part of the coast line which belongs to Newfoundland. Manitoba thus received about 113,984,000, Ontario 93,696,000 and Quebec 227,175,000 acres of additional territory. The agricultural possibilities of these new areas are at present unknown.

Effects of Climate.— Extending over such a large area and presenting topographical and orographical features of considerable variety, the Dominion of Canada possesses a series of different climates which influence and modify the local agriculture. The Atlantic provinces (Prince Edward Island, Nova Scotia and New Brunswick) have comparatively mild winters with a moist, cool atmosphere. Potatoes and root crops do well, and buckwheat is a special crop. In Quebec and in the eastern and northern parts of Ontario the winters are colder and the summers are warmer than they are at the coast on either seaboard. The ground is usually covered by deep snow during winter, and there are occasionally spells of severe cold in winter and of intense heat in summer, the latter usually tempered however by cool nights of great benefit to vegetation. A special characteristic is the rapidity with which the spring advances and merges into summer, and the rapidity of vegetation when once the winter snows have melted. In the southern parts of Ontario, especially that part of it which is known as the Niagara peninsula, the climate is considerably milder. Fruit cultivation is therefore a great feature, and tender fruits such as peaches, pears and grapes are grown to perfection. Corn is an important crop grown both for grain and green fodder or silage. The Prairie provinces (Manitoba, Saskatchewan and Alberta) have cold winters, but the air is dry and bracing. Usually, especially in Manitoba and Saskatchewan, an abundant snowfall protects the soil and ensures ample moisture during the early stages of plant growth. In Alberta the winter climate is variable, but milder as a rule than in the other Prairie provinces. Cattle ranching is a feature in certain parts, the animals being able during winter to remain out of doors and find their own food. The Chinook winds, which blow down from the Rocky Mountains, often cause a rapid increase of temperature to the extent sometimes of 60 degrees. In southern Alberta are large semi-arid areas in which irrigation and methods of dry farming are being successfully practised. Finally in British Columbia the climate varies greatly with altitude, latitude and coast proximity. The valleys are warm and suitable for a great variety of crops and for mixed farming. The areas near the coast have mild winters and a long spring, the conditions resembling those of the south of England. The precipitation varies a good deal. It is as much as 100 inches per annum in some parts; in others it is so scanty that agriculture is dependent upon artificial irrigation. This is being resorted to with marked success for fruits and vegetables.

Economic Factors.— Since the beginning of the present century agriculture in Canada has been profundly influenced by immigration and railway construction. The total number of immigrant arrivals in Canada during the 16 years ended 31 March 1916, was 3,099,348, of whom 1,168,292 came from the United Kingdom, 1,095,375 from the United States and 835,681 from all other countries. The largest number of immigrants in a single year was 402,432, who arrived in 1913. Partly dependent upon immigration and partly stimulating it there has been during the same period an extraordinary activity in railway construction. Two additional transcontinental lines, the National Transcontinental, constructed by the Dominion government and the Grand Trunk Pacific Railway, and the Canadian Northern, have been added to the previously existing line of the Canadian Pacific Railway opened in 1886. Altogether, during the first 16 years of the present century 19,773 miles have been added to the railway systems of Canada, the total mileage of which on 30 June 1916 stood at 37,430.

With a total land area of 1,401,316,413 acres, only 109,948,988 acres, or less than 8 per cent, were returned as occupied farm lands at the census of 1911, this area representing an increase since 1901 of 46,526,650 acres. Of the occupied area in 1911, 48,733,823 acres were returned as improved and 61,215,165 acres as unimproved land. The unimproved occupied land consists of 17,477,526 acres of natural forest, 4,174,270 acres of marsh land, etc., and the remainder of 39,563,369 acres of unbroken prairie or other land that is gradually being brought under the plough. Of the improved area of 48,733,823 acres, field crops occupy 35,261,338 acres, orchards and nurseries 403,596 acres, vegetables 206,011 acres, vineyards 9,836 acres and small fruits 17,495 acres. The remaining 12,835,547 acres of improved land consist of pasture, fallow or otherwise uncropped land. In 1911 the total number of occupiers of land was 714,646, an increase of 169,958, or 31 per cent, since the previous census of 1901. About 74 per cent of the holdings in Canada were over 50 acres in extent as compared with 68 per cent in 1901.

Field Crops.— During the decade 1900 to 1910 the area under field crops increased from 19,763,740 acres to 30,556,168 acres, a ratio of 54.6 per cent. In 1911 field crops occupied 35,261,338 acres, the increase for the 11 years representing over 78 per cent. During the past five years the total area under field crops has continued to be about 35,000,000 acres; but in 1915, under the stimulus of war, the acreage arose to its highest point, viz., 39,140,460 acres. The recent expansion of area has been chiefly in wheat, oats and flax, and is due to the opening up and settlement of the Prairie provinces — the great feature of Canadian progress since the beginning of the present century. The area under wheat, which was a little over 4,000,000 acres in 1900, increased to over 10,000,000 acres in 1914. Similarly, the acreage under oats has practically doubled, and flaxseed which only occupied 23,000 acres in 1900 occupied over 1,000,000 acres in 1914. During the last 30 years the distribution of the principal crops in Canada has undergone considerable change. In the 19th century the chief wheat-growing province of Canada was Ontario, and in 1890 the wheat acreage of this province was 1,430,532. But with the completion of the Canadian Pacific Railway in 1886 the fertile prairies of the West began to be opened up for wheat growing, and in 1890 the wheat area in Manitoba had grown to 896,622 acres from 51,293 acres in 1880. At the close of the century the wheat area of Manitoba was 1,950,200 acres, as against 1,487,633 acres in Ontario. In the first decade of the 20th century wheat growing in Ontario began to decline, while in the West it progressively increased so that in 1910 wheat in Ontario occupied only 870,354 acres, and in 1914 only 834,000 acres. The territories to the West of Manitoba also progressed; and since 1905, when the provinces of Saskatchewan and Alberta were formed, the three Prairie provinces have become the great wheat-producing area of the Dominion. The following statement showing the area under the principal grain crops in the Prairie provinces, as compared with the rest of Canada for the year 1915, will make this point clear:

CROP	Prairie provinces, acres	Rest of Canada, acres	Total acres
Wheat............	13,868,000	1,241,400	15,109,400
Barley............	1,171,000	547,000	1,718,000
Oats..............	6,481,000	5,075,000	11,556,000
Flaxseed..........	458,000	5,000	463,000

In the Prairie provinces, therefore, for the year 1915, wheat occupied 92, barley 68, oats 56 and flaxseed 99 per cent of the total area under these crops in the Dominion.

In most parts of Canada wheat is sown in the spring; but in the southern parts of Ontario and in Alberta, wheat, sown in the fall, ripens earlier and gives usually a higher yield than the spring sown varieties. With fall sown wheat there is always a proportion,— varying from about 5 to 30 per cent according to the mildness or severity of the season,— of the area that is winter-killed, but reploughed and resown in the spring in Manitoba, Saskatchewan and British Columbia there are also small areas upon which fall sown wheat is grown. Other crops that have a more or less local importance are buckwheat which is grown in the Atlantic provinces, in Ontario and in Quebec, corn, grown chiefly in Ontario and Quebec, and potatoes, which are an important crop in Nova Scotia and New Brunswick, where they occupy a larger area than does wheat.

The following table gives the area and production of all the principal field crops of Canada for the years 1900, 1914 and 1915 with annual averages for the five years 1910–14.

AREA

Crops	1914, acres	1915, acres	1910–14, acres
Fall wheat	973,000	1,030,600	1,010,000
Spring wheat	9,321,000	14,078,800	9,444,000
All wheat	10,294,000	15,109,400	10,454,000
Rye	111,000	122,000	121,000
Barley	1,496,000	1,718,000	1,500,000
Oats	10,061,000	11,556,000	9,749,000
Peas	206,000	196,000	267,000
Beans	44,000	43,000	48,000
Buckwheat	354,000	344,000	375,000
Mixed grains	463,000	467,000	478,000
Flaxseed	1,084,000	463,000	1,224,000
Corn for husking	256,000	253,000	290,000
Potatoes	476,000	486,000	476,000
Turnips, mangolds, etc	175,000	157,000	189,000
Hay and clover	7,997,000	7,777,000	8,268,000
Alfalfa	90,000	98,000	88,000
Fodder corn	317,000	332,000	302,000
Sugar beets	12,000	18,000	17,000

PRODUCTION

	Bushels	Bushels	Bushels
Fall wheat	20,837,000	29,321,000	22,003,000
Spring wheat	140,443,000	364,222,000	174,023,000
All wheat	161,280,000	393,543,000	196,026,000
Rye	2,017,000	2,486,000	2,155,000
Barley	36,201,000	54,017,000	41,436,000
Oats	313,078,000	464,954,000	343,612,000
Peas	3,363,000	3,464,000	4,140,000
Beans	797,000	723,000	874,000
Buckwheat	8,626,000	7,866,000	8,631,000
Mixed grains	16,382,000	17,518,000	15,652,000
Flaxseed	7,175,000	6,114,000	13,033,000
Corn for husking	13,924,000	14,368,000	16,231,000
Potatoes	85,672,000	60,353,000	75,190,000
Turnips, mangolds, etc	69,003,000	60,175,000	69,181,000
	Tons	Tons	Tons
Hay and clover	10,259,000	10,612,000	11,706,000
Alfalfa	218,000	261,000	217,000
Fodder corn	3,251,000	3,383,000	2,856,000
Sugar beets	109,000	141,000	164,000

It should be observed that in the preceding table the years 1914 and 1915 represent opposite extremes as regards production, the year 1914 being one of the poorest grain seasons on record, while in 1915 circumstances combined to produce the most abundant grain crops in the history of Canada. Yields in particular cases are frequently high, occasionally reaching for wheat 60, for barley 50 and for oats 100 bushels per acre; but the average rate in production for wheat in Canada is about 18¾ bushels per acre; in 1914 it was only 15½ bushels; in 1915 the average was 26 bushels. The average yield per acre of oats reached 40¼ bushels in 1915; over a series of years the annual average is about 35¼ bushels. Other crop averages in bushels per acre are as follows: Rye 21.3; peas 15.5; beans 18.2; buckwheat 23; flax 10.5; corn 56; potatoes 158; turnips, mangolds, etc. 366; hay and clover average about 1.42, alfalfa 2½, fodder corn 9½ and sugar beets 9½ tons. Among the numerous varieties of grain grown in Canada those most widely sown comprise for winter wheat Dawson's Golden Chaff in Ontario and Turkey Red in Alberta, for spring wheat the Marquis, Red Fife and White Fife, for barley Mensury, Mandscheuri and O. A. C. 21 and for oats American Banner and Siberian.

The average cost of grain production runs from about $12 to $14 per acre, the profit depending upon the yield and price which vary with the season and the world's crops. Corn costs more to produce, averaging from $19 to $22 per acre, but the value of the crop and the profit are correspondingly higher. The surplus of grain over home requirements is annually exported, and the Canadian grain trade is highly organized. Exports of wheat and flour, principally to the United Kingdom, have increased with the increasing production. In 1914, after the abundant yield of 1913 they were upwards of 142,000,000 bushels, and in 1916 after the record harvest of 1915 they reached the total of 289,794,162 bushels. There is usually a small surplus of barley, oats and other grains for export, and practically the whole of the flaxseed crop goes across the southern border. Hay, compressed mechanically, is also exported both to the United Kingdom and to the United States. The largest export in recent years was 784,864 tons in 1912; but the annual average is between 200,000 and 250,000 tons. Flour milling is an important Canadian industry and in 1915 the value of flour and grist mill products was $114,483,924 from 1,644 establishments.

Sugar beet for the manufacture of beetroot sugar has been grown in Canada since the beginning of the century. At present two factories, those of the Dominion Sugar Company at Wallaceburg and Kitchener in Ontario, are in operation for the manufacture of sugar from Canadian beetroot. For the season of 1915 the production of sugar beet was 141,000 tons from 18,000 acres, and the production of refined beetroot sugar was 39,515,802 pounds. Tobacco is grown in parts of Quebec and southern Ontario. In 1910 the production was 17,632,342 pounds from 18,928 acres. In 1915 the estimated production was about 9,000,000 pounds, and in 1916 about 5,943,000 pounds. The production of honey in 1910 was 6,089,784 pounds, the number of hives being returned as 100,372.

Farm Live Stock.— Canada is well suited to the raising of all descriptions of farm live stock, although sheep in the central and colder parts cannot be kept out of doors during winter in the large flocks that are customary in countries with milder climates. As a general rule, Canadian farm animals are remarkably free from disease, and the more virulent contagious maladies are entirely absent. The accompanying table shows the total number of horses, cattle, sheep and swine in the census years 1901 and 1911, and as estimated annually at the end of June by the Census and Statistics Office for the years 1912 to 1916.

Fine horses, both light and heavy, are bred in all the provinces. Horse ranching is practised largely in southern Alberta and in southwest Saskatchewan under the favorable conditions of comparatively mild winters and light snowfall with abundant wild hay and pasture. There is a good demand for heavy horses, both for agricultural purposes and for the drawing of logs from the lumber camps. The favorite draught horse is the Clydesdale, a medium size being usually preferred for farm work. Next in importance comes the Percheron of which by far the larger number are in Alberta. The French Canadian is the draught horse of the French farmers in Quebec. The English Shire horse is also raised principally in Ontario, and there are small numbers of the Suffolk Punch and of Belgian breeds. Among the light breeds the Standard Bred trotter, used largely in trotting and pacing races, and the Hackney predominate. Thoroughbreds and coach horses are also raised. Animals for cavalry and mounted infantry remounts are produced in all the provinces, and have been especially in demand for the war. In 1911 the number of pure-bred horses was 33,149, an increase of 22,393, or 208 per cent since 1901. Of the total, 19,911 or 60 per cent were Clydesdales. During the five years ended 31 March 1910–14 the average number of horses annually exported, chiefly across the southern border, was about 2,600; but in 1916 the exports rose to 26,818, of which 21,833 went to Great Britain, most of them as military remounts.

LIVE STOCK	1901	1911	1912	1913	1914	1915	1916
Horses	1,577,493	2,598,958	2,692,357	2,866,008	2,947,738	2,996,099	2,990,635
Milch cows	2,408,677	2,595,255	2,604,488	2,740,434	2,673,286	2,666,846	2,603,345
Other cattle	3,167,774	3,930,828	3,827,373	3,915,687	3,363,531	3,399,155	3,313,519
All cattle	5,576,451	6,526,083	6,431,861	6,656,121	6,036,817	6,066,001	5,916,864
Sheep	2,510,239	2,174,300	2,082,381	2,128,531	2,058,045	2,038,662	1,965,101
Swine	2,353,828	3,634,778	3,477,310	3,448,326	3,434,261	3,111,900	2,814,672

Cattle, principally of British origin, are bred in all the provinces, and, as in the case of horses, there are large ranches in Saskatchewan and Alberta. The beef breeds include Shorthorns, Herefords, Aberdeen Angus and Galloways, Shorthorns comprising the great majority. In Ontario cattle raising is a very important industry, the animals being fattened on grass lands during summer and in the stable during winter. Of late years, especially in the western counties of Ontario, fine herds of pure-bred cattle have gradually been established, and their quality has been maintained by large importations from the mother country. As a consequence the trade in pure bred stock with the United States has been considerably developed. Cattle throughout Canada have been reduced in numbers by slaughter for the purpose of meat exports to Great Britain in consequence of the war, but herds are being gradually replenished by the breeding of young stock. Amongst dairy cattle are the Shorthorn, Ayrshire, Jersey, French Canadian and Holstein-Freisian breeds. Many parts of the Dominion are quite favorable for the keeping of sheep and for the production of mutton and wool of the highest quality; but for various reasons this branch of the live stock industry has not been followed so generally as it might have been. In individual cases, however, sheep raising has proved very profitable under the management of skilled flockmasters. Nearly all the leading British breeds are to be found in Canada, the most numerous being the Shropshire, Oxford Down, Leicester, Cotswold and Southdown breeds. At the census of 1911 there were 53,616 pure bred sheep in Canada. The industry, in spite of earnest efforts to encourage it on the part of the government, has steadily declined. In 1881 the total number of sheep in Canada was 3,048,678; in 1911 the number was 2,175,302, a falling off of 873,376, or 28 per cent. Since the census of 1911 the numbers have continued to decline, and the estimated number on 30 June 1916 was 2,022,941, a further decline, since the census of 1911, of 152,361. The average price of wool has increased materially during the war; the prices in 1916 for washed and unwashed wool being respectively 50 and 37 cents per pound, as compared with 26 and 19 cents in 1914. Swine, unlike sheep, have increased steadily in numbers during the last 30 or 40 years. In 1881 they numbered 1,207,619, and in 1911 3,634,778. Swine raising, especially in the West, is a fluctuating industry, being largely dependent upon cheap feeding grain. When for instance prices rose suddenly on the outbreak of the war, pig feeding on the Prairie provinces became unremunerative, and large numbers were immediately thrown on the market at nominal prices. On 30 June 1916, the estimated number of swine in Canada was 3,474,840. The principal breeds are the Yorkshire, Berkshire, Chester White and Tamworth; but the Yorkshire largely predominate. In 1911, 56,457 pure bred swine were returned as on Canadian farms. Poultry raising as an adjunct to ordinary farming has made great strides. In 1911 the numbers of all descriptions of poultry were 31,793,261 of the value of $15,047,009, as compared with 17,922,658 in 1901 of the value of $5,723,890. The production of eggs in 1911 was 123,071,034 dozen, value $23,501,173. Turkeys are easily reared in Canada, and are often a valuable source of additional farm revenue.

Dairying Industry.— Dairying is practised in all the provinces of Canada, but it is carried on chiefly in Ontario and Quebec. The factory system for the manufacture of cheese and creameries for the making of butter have been largely instrumental in the development of the industry. Cheese factories date from the early sixties, the first cheese factory in Canada having been established on the farm of G. V. de Long at Norwich, Oxford County, Ontario, in the spring of 1864. Much has been done by both the Dominion and provincial governments to improve the methods of cheese making in Canada, as well as to repress fraudulent practices injurious to its reputation. Since 1890 Canadian trade in agricultural products to Great Britain has greatly developed and there has gradually been built up an increasing export trade in Canadian cheddar cheese which in the British markets now enjoys a high reputation for purity and excellence of quality.

Butter made under the creamery system was formerly exported in considerable quantities to Great Britain; but during the past decade,— a period coincident with a marked increase of the population of Canada by immigration — the exportation of butter has been greatly reduced, whilst for the same reason the quantities manufactured and exported of cheese have diminished. The production of milk has increased, but its use has been diverted from the making of cheese to the making of butter, of which comparatively little is available for export after satisfaction of home requirements. Since 5 Aug. 1909, when the Payne-Aldrich tariff took effect, there has been a considerable exportation of fresh cream from Canada into the United States. In the year 1916 the production of cheese in factories amounted to 192,968,597 pounds of the value of $35,512,622 as compared with 220,833,269 pounds of the value of $22,221,430 in 1900. The production of creamery butter in 1916 was 82,564,130 pounds of the value of $26,966,357, as compared with 36,066,739 pounds of the value of $7,240,972 in 1900, the number of factories and creameries being 3,446 as against 3,576 in 1900. The production of homemade butter in 1910 was 137,110,200 pounds as compared with 105,343,076 pounds in 1900, and in 1910 the production of home-made cheese was 1,371,092 pounds. For 1910 the total production of cheese was 201,275,297 pounds and of butter 201,808,365 pounds. In 1910 condensed milk products were made in 11 factories amounting to 27,831,596 pounds of the value of $1,814,871. During the five fiscal years ended 31 March 1916 the average annual exports of cheese have been 153,941,732 pounds as compared with 215,137,339 pounds for the first five years of the century. Similarly, for the same periods in the case of butter the exports have averaged 3,413,515 pounds as against 26,930,551 pounds. There is on the other hand a comparatively small importation of varieties of cheese not manufactured in Canada, amounting annually to about 1,500,000 pounds. Dairying in the Prairie provinces has recently made considerable progress, and there is every indication that the dairy products of these provinces will soon be more than sufficient to supply all the western requirements and leave a substantial surplus for export.

Fruit Growing.— This is an increasingly important branch of the agricultural industry in Canada. Apples, plums and small fruits are grown successfully all over Canada; but the production of fruits on a large scale is confined practically to three well-defined fruit growing districts, viz., the Annapolis Valley in Nova Scotia, the eastern, southern and western parts of Ontario, especially in the southern part of the Niagara peninsula, and in the valleys of British Columbia. In Nova Scotia apples for export are the chief fruit; but in the Niagara peninsula pears, peaches, grapes and other tender fruits, as well as apples, grow to perfection. In British Columbia great progress in fruit growing has taken place during the present century, and in certain parts of the province, where the rainfall is scanty, irrigation has been resorted to with marked success for the growth of all kinds of fruit. The census returns of 1911 show an increase in the area devoted to orchards of 47,490 acres, the area having grown from 356,106 acres in 1901 to 403,596 acres in 1911. Grapes are grown for wine making to a small extent in southern Ontario, and the total acreage under vineyards was 9,836 in 1911. The total number of fruit trees in bearing in 1911 was 14,002,145 and of non-bearing fruit trees the number was 8,315,236. The output varies considerably with the season and the prevalence of insect pests, but in 1910 the production of the following fruits was, in bushels, as follows: Apples 10,618,666; peaches 646,826; pears 504,171; plums 508,994; cherries 238,974; other fruits 47,789. Apples are exported principally to the United Kingdom, the quantity ranging during the past five years from 523,658 barrels in 1911 to 1,664,165 barrels in 1912. In 1916 the exports were 577,451 barrels. One barrel holds on the average about three bushels. A certain amount of cider is annually made in the apple growing districts, the exports being upward of 150,000 gallons and occasionally exceeding 200,000 gallons. Maple sugar and maple syrup are made on farms where the maple tree flourishes, chiefly in Quebec and Ontario. In 1910 the total production of maple sugar was 10,488,340 pounds and of maple syrup 1,802,581 gallons.

Value of Agricultural Production.— In 1915 the estimated value of the field crops of Canada was $825,370,000, but this was a year of exceptional abundance. For 1916 the total value was $886,494,900, owing to the high prices caused by the war. The average annual value of the total agricultural production of Canada may be placed at about $782,000,000, including field crops $650,000,000, dairy products $70,000,000, wool $2,000,000, poultry and eggs $25,000,00, and fruits and vegetables $35,000,000. The total value of horses, cattle, sheep and swine estimated at $903,686,000 for 1916.

Agricultural Organization.— Associated effort for the improvement of agriculture is largely directed and controlled by the state. There is not only a strong and many-sided Department of Agriculture of the Dominion government, but each of the nine provincial governments has also a department of agriculture serving local needs. Since 1911 an important advance has been made by the Dominion Parliament in appropriating large sums annually for the encouragement of agriculture under the Agricultural Instruction Act of 1913. The funds thus available are divided amongst the nine provinces and administered in close co-operation with the provincial departments of agriculture. The amount now annually appropriated under this act is about $1,000,000. A great deal of the work of the Dominion department is carried on through the experimental farms and stations which are situated in different parts of Canada. A central farm at Ottawa and four branch farms in Nova Scotia, Manitoba, the Northwest territories and British Columbia were originally established in 1886 under the Experimental Farm Stations Act. These five farms continued in operation for 20 years when their usefulness became so apparent that steps began to be taken for their extension; and two new stations were established in Alberta in 1907. Since then development has been rapid; and in 1917 the experimental farms and stations of the Dominion government originally five in number with a total acreage of 3,472, number 21 with an acreage of 11,148, not counting seven smaller substations at points in British Columbia, Alberta and the Northwest territories. The more strictly scientific work of the farms is organized at the central farm, Ottawa, in 13 divisions, comprising field husbandry, animal husbandry, horticulture, cereals, chemistry, forage plants, botany, poultry, tobacco, economic fibre, illustration stations, apiculture, extension and publicity. Amongst the results of greatest general influence upon Canadian agriculture, due directly to the experimental work of the farms, may be mentioned the practice of early sowing, the adoption of summer fallowing and the distribution of improved varieties of seeds of cereal and other plants, especially in the West. Phenomenal success has indeed attended one branch of the work of the experimental farms by the introduction of the Marquis variety of hard wheat. This wheat, which possesses all the good qualities of the Red Fife with the added advantages of an earlier ripening habit and superior yield, leaped into fame by taking the champion prize for the best hard wheat at the first American Land Show, held in New York from 3–12 Nov. 1911. Since then it has taken many similar prizes, and is now in process of rapid distribution throughout the western grain-growing area in replacement of the Red Fife. The work of the Dominion Department of Agriculture extends over many other important fields, including the seed branch for the analysis of seeds in respect of germination and purity; the dairy and cold storage branch; the fruit branch; the health of animals branch under a veterinary director-general; the live stock branch for improvement of farm live stock; and an entomological branch. All these branches not only administer laws affecting the subjects with which they deal, but also carry on scientific investigation at field and other laboratories. Important work in the improvement of farm seeds is being accomplished by the Canadian Seed Growers' Association, who work in close association with the seed branch of the department. The maintenance of pedigree registers of pure-bred live stock is in charge of a National Record Board which receives special grants, facilities and privileges from the Dominion government. Under the Live Stock Pedigree Act, 1900, the pedigree records of live stock were both unified and nationalized. Each of the breed societies in Canada, while remaining responsible for the local management of its own affairs, is represented upon the National Record Board for the issue of pedigree certificates, which before issue are certified by an officer of the live stock branch of the Department of Agriculture; so that every pedigree certificate has behind it a government guarantee of accuracy, a matter of considerable advantage in connection with international trade. Only the Holstein-Freisian Society of Canada remains outside this scheme. Much is being done to test experimentally the varieties of tobacco best suited to the Canadian climate and the best methods of cultivation, curing, marketing, etc. Canada is an adhering country of the International Institute of Agriculture, and an officer of the Department of Agriculture acts as Canadian commissioner of the Institute. The publications of the various branches of the department, most of which are issued gratis, are voluminous and diverse; so much so that within recent years a special branch of the department has been organized for their more effective distribution. This branch also issues monthly the *Agricultural Gazette of Canada.*

Of the provincial departments of agriculture, the oldest and most thoroughly organized are those of Ontario and Quebec. Farmers' institutes and clubs, women's institutes, agricultural and live stock associations and fairs are amongst the agencies employed; but probably the agricultural colleges and experiment stations in each province have the greatest influence. Foremost amongst these institutions are the Ontario Agricultural College at Guelph under the provincial department of agriculture and the Macdonald Agricultural College at Sainte Anne de Bellevue in the province of Quebec. The college at Guelph is remarkable for the comprehensive thoroughness with which it covers the whole wide field of agriculture. Its departments comprise field and animal husbandry, dairying, poultry, apiculture, horticulture, pomology, agricultural chemistry, bacteriology, zoology, entomology, botany and physics. The Ontario Agricultural and Experimental Union, which is organized by officers of the college for the conduct of annual co-operative experiments by farmers throughout the province, has been in existence for 38 years, and the average number of annual experimenters is about 4,500. The Macdonald College at Sainte Anne de Bellevue is a newer institution dating from 1907; but is gradually covering much the same ground for English-speaking students of the province of Quebec. Both colleges provide courses for the graduation of students with the degree of B.S.A. (Bachelor of Science in Agriculture) conferred by the universities to which they are respectively affiliated, viz., Toronto for Guelph and McGill for Macdonald. In the other provinces agricultural colleges and experiment stations exist at Truro (Nova Scotia). Oka and Saint Anne de la Pocatière (Quebec); Winnipeg (Manitoba); Saskatoon (Saskatchewan); Edmonton (Alberta) and Point Grey, Vancouver (British Columbia). Agricultural fairs, shows or exhibitions are held all over Canada, usually by the aid of grants from the provincial governments or municipalities. The largest of these exhibitions is held annually in August and September at Toronto by the Industrial Exhibition Association.

Future Prospects.— At present the great war in which the British empire is strenuously engaged affects Canadian agriculture by the absence at the front of many of its citizens, which renders more acute the scarcity of farm labor, limits production and increases its cost. These conditions are of temporary duration, and will change on the return of the soldiers and resumption of the immigration that was stopped on the outbreak of the war. It is probable that the immigrants who enter Canada after the war will settle upon agricultural lands instead of flocking to the towns for the development of municipal enterprises by means of borrowed capital, as was largely the case before the war. Conditions in Canada will make it essential that the actual development of agricultural resources shall in future be the first consideration. To what extent homesteads may be prepared in advance for settlement by returned soldiers and immigrants is engaging attention, and it is possible that the policy of ready-made farms on lines already adopted in Alberta by the Canadian Pacific Railway may be more extensively adopted. Future agricultural production in the West is likely to be largely influenced by the facilities of the Panama Canal, and already the Canadian government have constructed grain elevators at interior western points in anticipation of new grain movements in this direction. A railway from Le Pas in Manitoba to the southern shores of the Hudson Bay is under construction by the Dominion government with the object of providing an additional outlet for western grain through the Hudson Strait. A change in the direction of a more general adoption in the Prairie provinces of the practice of mixed farming is already in progress and will probably be hastened by the poor wheat seasons of 1914 and 1916, which have shown farmers the unwisdom of trusting to a single crop. But, probably, this will not entail any total decrease in the growing of wheat which will continue to be sown on newly-broken areas. Larger grain production is possible in Canada by an increase in the rates of yield per acre. Improved agricultural methods, including the more general adoption of mixed farming, the use of judicious rotations and more care in the selection of seed, will result in a large average yields per acre in the grain-growing provinces, as has already been the case in the older and more thickly settled parts of Ontario. Here there is evidence to show that during the past 35 years the average yields per acre have been increased by 3½ bushels for fall wheat, 2¾ bushels for spring wheat, 4½ bushels for barley and 1¾ bushels for oats. Similar future progress in the Prairie provinces will mean a large aggregate addition to the annual output. New lands in nearly all the provinces are available for settlement, and have been made easily accessible by the construction of railways. It is estimated that there are 56,000,000 acres of land more or less immediately available for agricultural settlement in Canada. Of this area about 31,000,000 acres are Crown lands at the disposal of the provincial governments in New Brunswick, Quebec, Ontario and British Columbia and about 25,000,000 acres are free grant surveyed lands at the disposal of the Dominion government in the Prairie provinces and the Railway Belt of British Columbia. The lands available in northern Ontario, through which run the new National Transcontinental and Canadian Northern railways, including an immense area of excellent agricultural soil, the great clay belt alone consisting of 24,500 square miles, or 15,680,000 acres, specially suitable for the growth of wheat.

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40. FOREST AND LUMBER INDUSTRY. A great forest stretches across the Dominion of Canada from the Atlantic seaboard to Alaska and the Pacific Ocean, and may be roughly divided into a northern forest and a southern forest. The northern forest may be subdivided into a sparsely wooded portion lying north of a line extending from the Strait of Belle Isle westward to the southern end of James Bay, and thence northwestward to Lake Athabasca and the Yukon River. South of this line lies a rather densely wooded portion separated from the southern forest by an irregular line running from Anticosti Island north of Lakes Saint John and Abitibi, south of Lake Nipigon, across the southern end of Lake Winnipeg, and northwestward to the headwaters of the Athabasca and Liard rivers. With the exception of the great plains region of southern Manitoba, southern Saskatchewan and southern Alberta, the southern forest extends as far south as the international boundary. Around the coasts of Nova Scotia and New Brunswick, along the Saint Lawrence River and in the southwestern part of Ontario it is largely cleared off for farming; while in Manitoba, Saskatchewan and Alberta there is a fringe of mixed prairie and woodland lying just south of the heavily wooded portion of the northern forest. In British Columbia is what is usually described as the Cordilleran forest. Along the Pacific Coast and on Vancouver and Queen Charlotte islands this forest has heavy stands of timber; in the southern interior part there is what is known as the "dry belt" forest; between the southern end of Kootenay Lake and Quesnel Lake lies the "wet belt" forest; while all the rest of the province and the southern part of the Yukon territory is occupied by an interior mountain forest with extensive fire-swept and grassland areas.

Total Forest Area.— The total land area of the Dominion is 3,603,910 square miles, or 2,306,502,400 acres, but it is not known with any degree of accuracy how much of this vast territory is covered with forest growth. The most reliable information available places it somewhere in the neighborhood of 700,000,000 acres, which is approximately 30 per cent of the total area. The exact areas of the forest containing timber of commercial sizes cannot be known until the Federal and provincial governments complete the surveys now in progress. For the present we may safely assume that Nova Scotia has 5,000,000 acres; New Brunswick 9,000,000; Quebec 100,000,000; Ontario 70,000,000; Manitoba 1,920,000; Saskatchewan 3,584,000; Alberta 5,416,000, and British Columbia 30,000,000 acres — making a total of about

225,000,000 acres or 9½ per cent of the total land area.

Control of Forest Lands.— In the provinces of Nova Scotia, New Brunswick, Quebec, Ontario and British Columbia the licenses to cut timber on specified tracts, known as "Timber Limits," are issued by the provincial governments; while in the provinces of Manitoba, Saskatchewan and Alberta and in the "railway belt" in British Columbia (a strip of 11,000,000 acres extending 20 miles on each side of the main line of the Canadian Pacific Railway) the Federal government, at Ottawa, controls the lands and issues licenses and permits to cut timber on "timber berths" and forest reserves. These licenses are obtained by public competition and the sum paid for the right to cut timber for a specified time is known as the "bonus price." In addition to the bonus price there is also paid a specified sum per annum per square mile (or per acre) known as the "ground rent," and when the timber is cut the "stumpage dues" are paid at the rate of so much per M (log scale), or per cord. These fees are the source of considerable revenue to the respective governments, which impose certain "regulations" regarding the methods of cutting and removing timber, protection against fire, etc. In no case does the holder of a license or permit acquire a right to the land, which reverts to the Crown as soon as his license expires or is canceled for non-fulfilment of the existing timber regulations.

Forest Reserves.— For many years both the Dominion and provincial governments have followed the policy of setting aside forest reserves and national parks for the purpose of providing a permanent supply of timber, of maintaining conditions favorable to a continuous water supply, and of protecting mammals, fish and birds within the boundaries of the reserves and parks. The Dominion forest reserves in Manitoba have an area of 2,941,600 acres; in Saskatchewan 6,748,954 acres; in Alberta 21,643,814 acres, and in the railway belt in British Columbia 3,485,590 acres — making a total of 34,819,958 acres. In British Columbia there are still 27,931,482 acres under provincial control while Ontario has 14,430,720 acres in forest reserves, and Quebec the huge total of 111,400,320 acres. Neither New Brunswick nor Nova Scotia have, as yet, established forest reserves; while all the land in Prince Edward Island has been alienated for farming purposes.

Federal Forest Service.— In 1899 the forestry branch of the Department of the Interior was established and at once inaugurated a policy of increasing the number and extent of the forest reserves upon Dominion lands. In 1900 arrangements were made to furnish settlers in Manitoba, Saskatchewan and Alberta with young trees and cuttings for the planting of wind-breaks and shelter belts. The settler entered into an agreement with the foresty branch to set aside a certain portion of his land as a permanent tree plantation, to carefully prepare his ground according to the directions of the tree inspectors, to plant the trees upon their arrival and to cultivate and keep the ground clean until the trees are large enough to take care of themselves. The species planted vary according to the climatic and soil conditions, and the great success of this co-operative plan is proved by the fact that approximately 95 per cent of the 20,000,000 trees and cuttings sent out to settlers are growing and are a source of great pleasure and comfort to all who have taken care of them. In 1906 the work of surveying and mapping the Dominion forest reserves was begun, and has been carried on ever since. In 1908 the work of collecting forest statistics from reliable sources was begun. In 1911 the work of examining and reporting upon lands thought to be suitable for forest reserves was begun, and has resulted in the creation of new reserves and additions to those already existing. In 1914 forest product laboratories were established at McGill University, Montreal, where exhaustive tests are being carried on to determine the technical properties of Canadian timber and the solution of problems connected with the pulp and paper industry. So rapidly has this most useful branch of the public service grown that in May 1914 it had 159 officers on its payroll, and the expenditure for the year amounted to $571,798. Since the outbreak of the European War many of these highly trained men have enlisted for over-seas service and the work of the branch is considerably hampered.

Other Forest Services.— In 1909 the province of Quebec began the extension of its forest service by employing two technically trained foresters as advisers, and most encouraging progress has been made all along the line of developing a progressive forest policy.

In 1911 the British Columbia department of land and forests established a forest branch which has made remarkable progress in the scientific administration of her forest lands and in making known to the world the extent and variety of her forest resources. Just before the outbreak of war the staff consisted of 170 members (including female clerks and stenographers), but the enlistment of 60 of its most efficient members badly crippled the service.

In 1912 the Canadian Pacific Railway Company established a department of natural resources and charged the forestry branch with the responsibility of administering timber lands owned by the company and the investigation of problems arising out of the use and preservation of timber for railway purposes.

In 1909 the Dominion government established a commission of conservation, which has devoted much time and energy to the protection of timber from fire, the making of forest surveys and the lessening of logging waste.

In 1912 the Dominion Railway Board introduced regulations for the protection of forest properties traversed by the steam roads, and the number of fires has been greatly reduced. In every province of the Dominion fire has done a tremendous amount of damage to standing timber and impoverished the soil for the growth of future wood crops. Now, however, the Federal and provincial authorities have realized the seriousness of the situation and effective steps are being taken to reduce the number of forest fires. Measures are also being taken to reduce the waste incident to logging operations; such as the waste in tree tops, the disposal of logging slash, etc.

Forestry Education.— In 1900 the Canadian Forestry Association was organized for the purpose of getting the public to realize the necessity of conserving the forest resources of the Dominion. Its membership is now 4,350 and it has been largely instrumental in securing advanced legislation in the matter of increasing the forest reserve area, a more careful administration of timber lands and protection from fire.

In 1907 the faculty of forestry was established in the University of Toronto for the purpose of giving young men a thorough technical training along lines required for the scientific management of forest properties, and in 1908 a similar department was established in the University of New Brunswick at Fredericton, N. B. A couple of years later a department of forestry was established in Laval University, Quebec, and plans are now under way for the establishment of a course in forest engineering in the University of British Columbia, Vancouver, B. C. Nearly all the graduates of these schools are employed by the Dominion forestry branch, the British Columbia forestry branch, the Quebec forest service, the New Brunswick forest service, and the forest service of the Canadian Pacific Railway Company.

Estimate of Standing Timber.— During the summer of 1909 and 1910 a reconnaissance survey was made of the forest lands of Nova Scotia. For the mainland the estimate is placed at 94,496 acres of virgin and semi-virgin coniferous timber with a stand of 1,133,952,000 board feet; 1,318,964 acres of moderately culled conifers carrying 3,956,892,000 board feet; 3,192,175 acres of severely culled and burned timber estimated at 3,192,175,000 feet, and 1,138,730 acres of green barrens and burns with 341,619,000 board feet. This makes a total of 5,744,365 acres with 8,624,638,000 board feet of coniferous timber. In addition to this there is the island of Cape Breton, which is estimated to have an area of 1,535,000 acres under forest more suitable for pulpwood than for saw timber. For the whole province the coniferous saw timber is approximately 10,000,000,000 feet, and the hardwoods probably amount to 5,000,000,000 feet.

New Brunswick is now engaged in the work of mapping and classifying lands still in possession of the Crown, and in the course of two or three years will have a close estimate of the amount of timber thereon. The present estimate for the whole province (Crown lands and alienated lands) is 12,000,000 acres, carrying 22,000,000,000 feet of saw timber — mostly spruce, pine, tamarack and cedar.

Quebec has at least 265,000,000 acres of nearly pure coniferous forest, 52,000,000 acres of mixed conifers and hardwoods, and 5,000,000 acres of hardwoods, but no reliable figures are available for the amount of standing timber. Most of it is more suitable for pulpwood than for saw timber, although large quantities of the latter are taken out every spring — especially from lands tributary to the rivers flowing into the Saint Lawrence and Ottawa rivers.

Ontario probably has more saw timber than any other province except British Columbia. The northern forests contains something like 180,000,000 acres of spruce, jack pine, balsam fir and tamarack (much of it of little value), and the southern forests about 100,000,000 acres carrying approximately 200,000,000,000 feet of saw timber. In 1917 the Department of Lands and Forests made extensive preparations for the organization of a thoroughly efficient fire protection service, and introduced stringent regulations regarding the disposal of logging slash, which in times has been a menace to both lumbermen and settlers.

In the case of the «Prairie provinces» there are less than 11,000,000 acres of timberland with a total stand of approximately 42,000,000,000 feet of timber distributed as follows: Manitoba with 1,920,000 acres and 6,850,000,000 board feet; Saskatchewan, 3,584,000 acres and 14,000,000,000 board feet; Alberta, 5,416,000 acres and 21,000,000,000 board feet.

In the Yukon and Northwest territories the timber has practically no commercial value, because of its inaccessibility, smallness and low stumpage per acre.

In British Columbia the forest branch estimates the total stand of commercial timber at somewhere between 350,000,000,000 and 400,000,000,000 feet. Approximately one-third of it is Douglas fir and one-fifth western cedar; the remainder being almost entirely made up of western hemlock, larch, yellow pine, white pine and jack pine. The estimate of timber suitable for pulpwood is placed at 250,000,000 cords.

From the above estimates it will be seen that the total amount of merchantable saw timber is somewhere in the neighborhood of seven hundred billion feet — approximately 28 per cent of the merchantable timber in the United States of America.

Annual Cut of Timber.— Nearly all the coniferous timber cut in the eastern and central parts of Canada is floated down the creeks, lakes and rivers to convenient milling points, from which it is shipped by rail or water to market. In the case of hardwoods the usual method of removal is by sleigh-haul, as they are generally used for fuel, distillation, cooperage — only a limited amount being used for furniture and interior finishing. In British Columbia the absence of drivable streams renders the use of logging railways, yarding engines and aerial skidders necessary for the removal of Douglas fir and other large timber.

For the year 1915 the production of sawn lumber was as shown below:

PROVINCE	No. of firms reporting	Cut, in board feet
Quebec	1,578	1,078,787,000
Ontario	656	1,035,341,000
British Columbia	238	669,816,000
New Brunswick	240	633,518,000
Nova Scotia	366	294,475,000
Saskatchewan	13	62,864,000
Manitoba	37	42,357,000
Alberta	13	17,975,000
Prince Edward Island	43	7,543,000
Totals	3,239	3,842,676,000

The value of this cut of lumber was estimated at $61,919,806, which gives an average price of $16.11 per M. Although 25 different kinds of wood were sawn; the five leading species being spruce, which made up 40.7 per cent of the total cut; white pine (eastern and western) 22.1 per pent; Douglas fir 11.8 per cent; hemlock (western and eastern) 6.2 per cent, and balsam fir 6.1 per cent. For the remaining 13.1 per cent of the total cut the next five species were red pine, birch (yellow and white), cedar (western and eastern), maple (sugar and red), and larch (western and eastern)— which made up 10 per cent of the total cut. The remaining 3.1 per cent was made up of western yellow pine, jack pine (eastern and western), basswood, elm, ash, poplar, beech, oak, yellow cypress, hickory, chestnut, cherry, butternut and walnut.

The quantity of lath manufactured was:

PROVINCE	Number of thousand	Percentage of total
Ontario	309,022	39.0
New Brunswick	288,951	36.4
Nova Scotia	59,921	7.5
Quebec	55,204	7.0
British Columbia	46,345	5.8
Saskatchewan	23,611	3.0
Manitoba	8,910	1.1
Prince Edward Island	1,262	0.2
Totals	793,226	100.0

The total value of the 793,226,00 lath sawn was placed at $2,040,819, which gives an average price of $2.57 per M. The five leading species of wood used were spruce, white pine, cedar. Douglas fir and hemlock.

The cut of shingles was as follows:

PROVINCE	Number of thousand	Percentage of total
British Columbia	1,894,642	61.3
Quebec	574,794	18.6
New Brunswick	458,987	14.9
Ontario	93,497	3.0
Nova Scotia	30,733	1.0
Alberta	18,740	0.6
Prince Edward Island	17,589	0.6
Saskatchewan	404	....
Manitoba	81	....
Totals	3,089,470	100.0

The total production of 3,089,470,000 shingles was valued at $5,734,852, which gives an average value of $1.86 per M. Cedar made up 90.5 per cent of the total cut; with spruce, white pine and jack pine next in order.

Pulpwood, Poles and Ties.— Since 1908 the consumption of wood for the manufacture of pulp has increased almost threefold, and is certain to increase still more. The annexed table shows the consumption and average price per cord for the year 1915:

	No. of firms reporting	Cords	Value	Average value per cord
Quebec	24	697,962	$4,227,033	$6.06
Ontario	15	480,627	3,806,804	7.92
New Brunswick	4	115,842	732,521	5.32
British Columbia	2	90,535	550,809	6.08
Nova Scotia	5	20,870	99,050	4.75
Totals	50	1,405,836	$9,426,217	$6.71

These figures show that 49.6 per cent of the pulpwood was used in Quebec, 34.3 per cent in Ontario, 8.2 percent in New Brunswick, 6.4 per cent in British Columbia and 1.5 per cent in Nova Scotia; while the total consumption of 1,405,856 cords is an increase of 14.8 per cent over that for 1914. Spruce made up 71 per cent of the total, balsam fir 21 per cent, hemlock 4 per cent, jack pine 3 per cent and poplar 1 per cent. Of mechanical pulp the amount produced was 743,770 tons, of sulphite 235,474 tons, of sulphate 92,404 tons and of soda pulp 3,150 tons. This makes a total of 1,074,805 tons, which is an increase of 15 per cent over the production of 1914. The manufacture of pulpwood is one of the few industries, not engaged in the production of munitions, which have not suffered from war conditions. Although labor conditions have been disturbed and the cost of raw materials has increased, the American demand for pulp has increased and the difficulty of obtaining it from Scandinavian sources has increased the over-seas demand.

The total number of telegraph and telephone poles sold in 1915 is reported as 179,248; at an average price of $2.52 each. Exactly 67.4 per cent of them were of eastern cedar, 11.1 per cent of western cedar, 9.3 per cent of tamarack, 5.6 per cent of spruce, and 2.3 per cent of jack pine — the remaining 4.3 per cent being of fir, hemlock, chestnut and oak.

The total number of cross-ties sold in 1915 is given at 7,592,530, and their average price at 44 cents each. Jack pine made up 32.4 per cent of the total, eastern cedar 25.8 per cent, hemlock 11.1 per cent, tamarack 8.3 per cent, eastern spruce 6.7 per cent, Douglas fir 5.3 per cent and oak 4.3 per cent — the remaining 6.1 per cent being made up of yellow birch, chestnut, maple, elm and western cedar. It is worthy of note that the total number of ties sold in 1914 was 19,403,646, or more than two and a half times that for 1915.

The following figures show the values of the exports of forest products for the year ending 31 March 1916:

DESTINATION	Unmanufactured	Manufactured
United States	$34,573,005	$9,555,016
Great Britain	14,125,537	1,008,821
Other countries	2,504,428	934,033
Totals	$51,292,970	$11,497,870

The manufactured articles consisted mainly of pulpwood, saw logs, ties, posts, poles, piling, firewood, tanbark, square and waney timber, planks, boards and scantling, and the manufactured articles of wood pulp, furniture, barrels, etc.; the value of both amounting to $62,790,840.

Total Value of Forest Products.— The following table is based partly upon actual statistics and partly upon the estimates of the Dominion forestry branch, and shows the estimated value of different classes of forest products for the calendar years 1913 to 1915, inclusive:

KIND OF FOREST PRODUCT	1913	1914	1915
Lumber, lath and shingles	$71,000,000	$67,500,000	$69,750,000
Pulpwood	15,000,000	15,500,000	15,750,000
Poles	1,800,000	700,000	500,000
Ties	9,000,000	9,000,000	3,500,000
Round mining timbers	600,000	500,000	680,000
Posts and rails	10,000,000	9,500,000	9,000,000
Firewood	55,000,000	60,500,000	60,650,000
Cooperage	1,900,000	1,900,000	1,400,000
Tanbark	20,000	22,000	170,000
Miscellaneous products	11,000,000	10,000,000	9,500,000
Logs exported	900,000	850,000	1,325,000
Square timber exported	500,000	400,000	480,000
Miscellaneous exports	400,000	300,000	175,000
Totals	$177,120,000	$176,672,000	$172,880,000

This table gives a fairly accurate idea of the magnitude and stability of the forest industries of Canada.

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41. THE GRAIN TRADE. The Canadian grain trade has been subject to legislative control from an early date; but the first enactment after confederation applicable to the whole of Canada was in 1874 when the Dominion Parliament passed the General Inspection Act dealing with a large variety of staple commodities. Under this act the different brands of flour and meal were legally defined, and special provisions were included for the grading of grain. After the establishment of a grain-growing industry in the province of Manitoba, an act of 1885, in further amendment of the General Inspection Act of 1874, considerably extended the grades of grain and introduced for the first time grades descriptive of the hard wheats of Manitoba and the Northwest territories. Subsequently the legislation affecting the warehousing and transportation of grain became merged in the Manitoba Grain Act of 1900 and amending acts. The Inspection Act covered the inspection, grading and weighing of grain up to 1904, when all matters affecting grain were withdrawn from that act and embodied in the Grain Inspection Act, 1904, which on the revision of the statutes in 1906 became Part II of the Inspection and Sale Act.

The Canada Grain Act.—Four years ago the Dominion legislation affecting the Canadian grain trade was codified by the Canada Grain Act of 1912, which also included numerous additional provisions of important character. The act provides for the appointment by order in council of a board of three commissioners, known as the Board of Grain Commissioners for Canada, who are charged with the management and control of the grain trade for the whole of Canada in accordance with the terms of the act. The offices of the board are at Fort William where, and at the twin city of Port Arthur, are situated the large terminal elevators from which grain is discharged into the lake steamboats plying eastward. For the purposes of grain shipment Canada is divided into two inspection divisions, the Eastern and Western. The former comprises the portion of Ontario lying east of Port Arthur and Quebec and the Maritime provinces, while the latter comprises the portion of Ontario lying west of and including Port Arthur, the Northwest provinces and territories and British Columbia.

Grain Elevators.—These constitute an integral part of the grain trade as controlled by the act, and the development of grain growing in the Northwest made their introduction into Canada a necessity. The first Canadian grain elevators were constructed shortly after the year 1880. Before this date grain grown in Canada was shipped through flat warehouses built by grain dealers at points along the railway line. The grain was bought by the dealers, stored in the warehouse and shipped in car lots for sale in Winnipeg. The warehouse was a simple wooden storehouse, built parallel with the railway track. A passageway across divided the house in two and each end was subdivided into bins. The machinery usually consisted of a scale in the passageway, a trolley for pulling the sacks and a grain cart to handle the grain in bulk. The grain was weighed, piled loose in the bins and drawn in the cart to the railway car. This system has become antiquated, and the flat warehouses, of which there are now only about 24 in Canada, tend annually to disappear.

Dissatisfaction on the part of grain growers with the management of the elevators led to the introduction of what are called “loading platforms.” The platform is a wooden structure on a railway siding to which a farmer can drive his team and from which he can shovel the grain into the car. When the grain has been loaded, he can either sell it on the spot as track grain, or consign it to a commission firm in Winnipeg to be sold for his account. By using the platform a farmer can protect himself from the possibility of malpractice on the part of the elevator, and can save the elevator charges amounting to about $17 per car. On the other hand he has to secure the car, make his own arrangements for selling the grain and load the grain into the car with his own labor. In spite of these disadvantages as compared with the elevators, the loading platforms are popular, and applications for new and larger ones are constantly being made. There are at present about 1,600 of these platforms, and Dr. Magill, when chairman of the Board of Grain Commissioners, in a report on grain inspection in Canada, estimated that the proportion of grain loaded over platforms was about one-third of the whole.

With regard to the elevators themselves it will be understood that the name refers originally to the mechanical devices employed for hoisting grain in order to store it in bulk. The mechanical device most generally employed is on the endless chain and bucket principle. This is applied for lifting the grain perpendicularly, whilst belts called conveyors are also used to convey it horizontally for the purpose of shooting it into different bins. But the term elevator, whilst originally employed to designate the machinery for hoisting, has come to signify also the building used for the storage and handling of grain. It is in this sense that the term is employed for the purpose of this article.

There are now in Canada six different kinds of grain elevators. There are first what are called the “country elevators.” These, as defined by the Canada Grain Act, include all elevators and warehouses which receive grain for storage before inspection and which are erected at a railway station or on railway lands. As a general rule the country elevators are owned and operated by commercial companies or by farmers' co-operative companies. When the farmer takes his grain to a country elevator he can either sell the grain to the operator, in which case it is called “street grain,” or he can hire a bin in the elevator to keep his grain distinct from all other grain, in which case it is called “special binned grain,” or he can store it with other grain of the same grade. If he stores the grain either in a special or general bin, he arranges with the railway company for a car, and the elevator loads the grain into the car to his order. When the grain is loaded he can either sell it on the spot as track grain or send it forward consigned on commission. In 1916 the total number of country elevators and warehouses was 3,014 with an aggregate storage capacity of 94,322,000 bushels.

Next in order come the large terminal elevators, which are situated at Fort William and Port Arthur, the twin cities at the head of Lake Superior, to which the country elevators are tributary, and from which the grain is shipped by the lake steamboats to Montreal, or to the lake ports of Canada and the United States. These elevators are called «terminal» not because they are situated at the railway termini, but because the inspection of western grain ends at them. Of these terminal elevators at Fort William and Port Arthur there are 13 with a total capacity of 40,435,000 bushels.

Other descriptions of elevators include 22 «public elevators» with a capacity of 29,250,000 bushels, 19 «hospital elevators» with a capacity of 2,560,000 bushels for the cleaning or other treatment of rejected or damaged grains and three milling elevators with a capacity of 1,700,000 bushels used in connection with the manufacture of grain products in the western inspection division. Under powers conferred by the Canada Grain Act, and partly for the purpose of meeting a contemplated western expansion of trade through the opening of the Panama Canal, the Dominion government has erected and is operating four new interior terminal elevators. These are situated at Port Arthur, Saskatoon, Moosejaw and Calgary, and have an aggregate capacity of 9,500,000 bushels. At Vancouver, also, a public or transfer elevator, with a capacity of 1,250,000 bushels, has been erected by the government to facilitate the loading of grain in ocean steamships. Altogether the Dominion government has licensed 3,078 grain elevators and warehouses with an aggregate storage capacity of 180,988,000 bushels. In 1901 the licensed grain elevators in Canada numbered 523 with a total storage capacity of 18,329,352 bushels; so that the difference between these figures and those just quoted for 1916 shows how great has been the development of the trade since the beginning of the 20th century.

Inspection and Grading.— Under the Canada Grain Act all Canadian grain shipped in car load lots or cargoes from elevators is subject to government inspection and grading, and the grain is sold both at home and abroad on the inspection certificate entirely by grade and not by sample. As each car arrives at an inspection point it is sampled and graded by qualified samplers and inspectors appointed under the act. When the grain arrives at the terminal elevators it is weighed, cleaned and binned according to grade under the direct supervision of the inspectors, and a warehouse receipt is issued by the elevator operator to the owner of the grain. When the grain leaves the terminal elevator in car or cargo lots it is again weighed and inspected, and it must be graded out as graded in; that is, if it was received into the terminal elevator as «No. 1,» grain of equal quality must be shipped out. Thus the identity of the grade of exported grain is carefully preserved through every stage of movement. There are a number of inspection points; but for grain going west the principal inspection point is Calgary. Duluth is the inspection point for bonded grain going through the United States. Winnipeg is the inspection point for all eastward bound grain and Fort William and Port Arthur are the points of inspection for grain leaving the terminal elevators.

Under the act Canadian grain is divided into five general classes, viz., «Statutory grade,» «Commercial grade,» «Rejected,» «Condemned,» and «No grade.» The statutory grade means for each grain the highest grades, as defined in the act. There are four of these grades for western spring wheat, viz., No. 1 Hard and Nos. 1, 2 and 3 Northern. The act prescribes that the first two of these grades shall be «sound and well cleaned, weighing not less than 60 pounds to the bushel and composed of at least 75 per cent for No. 1 Hard and 60 per cent No. 1 Northern of hard Red Fife wheat.» No. 2 Northern must be «sound and reasonably clean, of good milling qualities and fit for warehousing, weighing not less than 58 pounds to the bushel and composed of at least 45 per cent of hard Red Fife wheat.» No. 3 Northern comprises grain not good enough for No. 2 that is graded No. 3 at the discretion of the inspector. A variety of other «statutory grades» are established under the act for spring wheat, goose wheat, winter wheat, Indian corn, oats, rye, barley, peas, buckwheat and flax, with distinctions for grain grown in the West. In addition to these statutory grades, other grades are established each year under the authority of the act by the Standards Board consisting of experts appointed by the Grain Commissioners to establish «commercial grades» in addition to the statutory grades. These extra commercial grades vary with the season, whilst the statutory grades remain invariable. The effect of these arrangements is that there may be as many as 31 grades of western spring wheat alone, 30 grades of western winter wheat, 30 grades of oats, 15 of barley and 15 of flax. Of the other three classes, i.e., grain not graded, «rejected grain» means all grain that is unsound, musty, dirty, smutty or sprouted or that contains a large admixture of other kinds of grain, seeds or wild oats or that from any other cause is unfit to be classed under any of the recognized grades. «Condemned grain» means all grain that is in a heating condition or is badly binburnt, whatever grade it might otherwise be, and «No grade» means all good grain that has an excessive moisture, being tough, damp or wet, or otherwise unfit for warehousing.

All grain in Canada is sold, unless otherwise contracted for, by certain legal weights per bushel. These were originally fixed by an act of the Dominion Parliament passed in 1879. At the present time the legal weights per bushel for the principal grains are as follows: Wheat 60 pounds, rye 56 pounds, barley 48 pounds, oats 34 pounds, Indian corn 56 pounds.

Exports of Canadian Grain.— Although the acreage and production of wheat and oats, the two principal grain crops of Canada, are similar in extent and quantity, it is only the wheat that figures very largely in the export returns. Oats are used mainly for the home feeding of live stock, and the surplus for export is not considerable except after very abundant seasons. The following table shows for each of the five years ended 31 March 1916 the quantity and value of the principal grains exported to the United Kingdom, to the United States and to other remaining countries:

EXPORTS OF GRAIN FROM CANADA FOR THE FIVE FISCAL YEARS ENDED 31 MARCH 1912–16.

QUANTITIES.

GRAIN AND YEAR	To United States	To United Kingdom	To other countries	Total
Wheat and wheat flour:	*Bushels*	*Bushels*	*Bushels*	*Bushels*
1912....	1,265,342	71,062,771	9,274,505	81,602,618
1913....	9,971,952	90,923,185	12,795,236	113,690,373
1914....	7,611,109	121,383,242	13,579,733	142,574,084
1915....	4,332,326	78,679,788	11,599,483	94,611,597
1916....	9,516,756	158,264,253	19,298,774	187,079,783
Rye:				
1912....	11,670	....	....	11,670
1913....	616	25,544	....	26,160
1914....	16,978	95,413	45	112,436
1915....	146,055	87,282	30,085	263,422
1916....	426,437	153,883	64,400	644,720
Barley:				
1912....	919,967	921,757	219,943	2,061,667
1913....	773,281	5,556,090	126,604	6,455,975
1914....	1,584,851	10,905,712	541,806	13,032,369
1915....	366,104	4,388,577	821,968	5,576,646
1916....	866,573	4,915,517	646,283	5,928,373
Oats:				
1912....	203,560	7,014,645	1,662,470	8,880,675
1913....	1,726,580	7,293,004	1,458,970	10,478,554
1914....	18,928,221	13,903,389	2,165,054	34,996,664
1915....	3,825,549	8,537,236	5,405,381	17,768,166
1916....	1,364,479	17,597,470	7,854,373	26,816,322
Flaxseed:				
1912....	991,802	495,496	17,230	1,504,528
1913....	7,561,004	2,536,336	26,353	10,123,693
1914....	10,164,536	8,579,713	1,903,078	20,647,327
1915....	7,006,249	675,318	7,958	7,689,525
1916....	1,930,592	13,951	....	1,944,543

VALUES

GRAIN AND YEAR	To United States	To United Kingdom	To other countries	Total
Wheat and wheat flour:				
1912....	$1,055,437	$68,409,868	$9,159,322	$78,624,627
1913....	8,487,726	87,420,634	12,671,059	108,579,419
1914....	6,977,369	118,281,074	13,041,853	138,300,296
1915....	4,456,472	82,264,757	12,183,265	98,904,494
1916....	10,102,339	175,520,423	23,040,727	208,663,489
Rye:				
1912....	7,685	....	....	7,685
1913....	603	14,305	....	14,908
1914....	11,473	64,393	22	75,888
1915....	138,855	93,291	27,476	259,622
1916....	362,654	136,017	57,346	556,017
Barley:				
1912....	588,026	607,933	158,341	1,324,300
1913....	440,468	3,315,172	96,020	3,851,660
1914....	709,092	5,514,016	290,449	6,513,557
1915....	203,118	2,520,084	538,823	3,262,025
1916....	225,843	3,229,986	319,512	3,775,341
Oats:				
1912....	90,920	2,903,708	825,014	3,819,642
1913....	739,357	3,592,247	736,346	5,067,950
1914....	6,802,403	5,644,951	932,495	13,379,849
1915....	1,536,465	4,067,540	3,357,121	8,961,126
1916....	632,748	8,606,102	5,398,999	14,637,849
Flaxseed:				
1912....	1,802,894	1,004,888	34,460	2,842,242
1913....	11,885,186	4,537,360	26,353	16,448,899
1914....	11,910,681	10,482,556	2,423,096	24,816,333
1915....	9,420,263	928,346	11,094	10,359,703
1916....	2,926,421	47,511	....	2,973,932

It will be seen from this table that the bulk of the exports of both wheat and oats goes to the United Kingdom. In the case of wheat the percentage proportions for the last fiscal year were for quantities 85 per cent to the United Kingdom, 5 per cent to the United States and 10 per cent to remaining countries. In Ontario and Quebec, and to a less extent in the Atlantic provinces, there is a large production of all kinds of grain, a considerable proportion of which enters into commerce, but of which very little is available for export from Canada.

It is estimated that of wheat Canada requires annually for home consumption about 96,000,000 bushels, of which 48,000,000 bushels or one-half represents food for the population of eight millions, and 48,000,000 bushels are either used for seed or are grain of inferior qualities kept on the farm for the feeding of live stock. Following the great increase of settlement during the present century the exports of wheat from Canada, especially to the mother country, have been rapidly expanding; and have reached in recent years a total equivalent to about 144,000,000 bushels, or about 67 per cent of the total British imports of wheat and flour. After the season of 1915, when high tide was reached by the most abundant harvest ever reaped in Canada, the Canadian exports of wheat (including flour) for the crop year ended 31 Aug. 1916 were 289,794,162 bushels.

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42. MINERALS. From a country so vast and of such varied geological structure as Canada one expects a wide range of mineral deposits, and the expectation is not disappointed, for already most of the minerals known to exist elsewhere have been found in the Dominion, and often in important deposits, though only its southern fringe has been explored. However, up to the present, Canada's mineral production must be looked on as at the stage of promise rather than performance, except in a few substances where nature has given her the lead. For example, the world's supply of asbestos comes from the province of Quebec, and more than three-quarters of its supply of nickel is obtained from mines in Ontario, while rich placer mines have produced largely in the Yukon, and Cobalt supplies the needs of the world for that metal and has attained a great place in silver production. Canada is backward in the production of iron and steel, basic factors in the development of a country, and stands relatively low as a producer of coal, though the fact that the only deposits of good coal on tide-water in America, both on the Atlantic and Pacific, are Canadian, is a fact of much importance which has produced great metallurgical industries in Nova Scotia.

Until recently the exploitation of Canadian mineral resources has been largely due to foreigners, especially Americans; but Canadian and British capital are now turning in this direction.

In 1913, the year of greatest output, the total value of the mineral products of Canada was $145,634,812, about $18.75 for each inhabitant, as compared with $24.50 per capita in the United States, where the total reached $2,445,805,017 in the same year. The area of Canada is about equal to that of the United States and in the parts best explored its mineral resources give promise of equalling in value those of corresponding States of the Union; so that an immense expansion in mining is to be looked for in the next generation.

The mineral production of Canada is very unequally distributed among the provinces, Ontario coming first with nearly 45 per cent of the whole, followed by British Columbia with 21 per cent and Nova Scotia with 13 per cent and the other provinces with smaller percentages. It is interesting to note that Ontario, one of the oldest and presumably best known of the provinces, has had important mineral discoveries in recent years increasing its output threefold in the last decade. Of the Maritime provinces of eastern Canada only Nova Scotia can be described as a mining region, gold and coal having been produced there for nearly half a century. Quebec is not of great importance except for its asbestos mines. Ontario produces a variety of minerals, nickel, silver and gold being foremost, while British Columbia provides gold, silver, copper, lead, zinc and coal, and the Yukon gold.

Following the usual classification, the minerals of Canada may be taken up under three heads, metals, non-metallic minerals and structural materials.

METALS.

Ores of 15 metals have been mined in Canada — antimony, chromium, cobalt, copper, gold, iron, manganese, mercury, molybdenum, nickel, palladium, platinum, silver, tungsten and zinc, and minerals containing a number of other metals have been found, though they have not yet been mined. Only eight of these metals are prominent economically, gold, silver, nickel, copper, lead, cobalt, zinc and iron, and attention will be directed mainly to them.

Gold.— The gold areas of Canada are widespread but the production has been very fluctuating the value in recent years varying from $907,601 (in 1892) to $27,908,153 (in 1900) and standing at $15,983,007 in 1915. In 1900 Canada was third in rank as a producer of gold, being surpassed by the United States and Australia only; but has dropped to the fifth place since then, yielding to South Africa and Russia. Three provinces and one territory are gold producers at present. Nova Scotia has carried on quartz mining, on "saddle reefs" like those of the famous Bendigo region in Australia, for more than 50 years, but has seldom exceeded $500,000 per annum, the value falling to $137,178 in 1915. Ontario also produces gold from quartz mines, but until recently only in small amounts. Since the opening up of the important Porcupine gold region in 1912 the output has rapidly increased, reaching $8,386,956 in 1915. The Porcupine district is now the most productive in the Dominion. Before the sudden rise of the Klondike, British Columbia was the greatest gold region of Canada, its history beginning with the times of wild excitement in the sixties, when thousands of miners from California swarmed into the rich placers of the Fraser and Columbia rivers and washed out millions of dollars worth, reaching the climax of $3,913,563 in 1863. The easily available placers were gradually exhausted, the value falling in 1893 to $379,535, a little less than the output of Nova Scotia in the same year; but the production of lode gold, especially from the smelting ores of Rossland on the southern edge of the province, once more placed British Columbia in the first rank. In 1908 the yield was $9,529,880, of which $3,600,000 came from placer mines, mostly in the Cariboo and Atlin districts in the north, the rest from smelting ores and a few quartz mines in the south; but this has fallen off to $5,628,982.

The prairies furnished a small amount of placer gold from bars on the Saskatchewan and other rivers for a number of years, but it was not until the working of the Klondike placers in 1897 that gold mining assumed importance in the north. This region, in lat. 64°, 500 miles below the headwaters of the great Yukon River, was unique as a placer mining country, reminding one of the famous placers of California and Australia, but surpassing them in difficulty of access and of working conditions, as well as in richness. For its length Eldorado Creek, a tributary of Bonanza Creek, was the most productive ever mined, but its gravels are nearly worked out, and the yield of gold, though still great for so small a region as the Klondike, which is about 40 miles square, has fallen since 1900, when it was estimated at $22,275,000, to $4,755,721 in 1915. The gold-bearing gravels were perpetually frozen and usually buried under several feet of frozen muck, so that the ground had to be thawed before it could be worked. At first this was done by building fires, but later steam delivered from steel pipes driven into the ground was employed, and it was found, also, that when stripped of moss the warm summer's sun thaws layer after layer, which may then be sluiced off in the ordinary way. All the rich placers have now been worked, but dredges and hydraulic plants are covering the ground again with good results. In 1915 these methods produced the amount mentioned above, but a gradual falling off may be expected in the future.

Silver.— For many years Ontario was the chief province for silver, the mine at Silver Islet near Thunder Bay on the north shore of Lake Superior being credited with a total output of $3,250,000, while several other mines to the west of Thunder Bay were also worked. For a while British Columbia took the lead in the production of silver, beginning in 1892, and culminating in 1897 with an output of over $3,000,000. In 1897, Ontario produced only 5,000 ounces, worth about $3,000, but from that date onward there was a yearly increase in her output, until in 1911 it was 30,540,754 ounces, valued at $16,279,443. British Columbia's production was only 1,887,147 ounces in the same year. Cobalt has been declining in its silver production since 1911, the amount in 1915 being 23,568,147 ounces, while British Columbia's production rose to 3,628,727 ounces.

Nickel.— This metal has become of practical value only since 1889 and methods of reducing its ores are still somewhat in the experimental stage. The world's supply comes almost entirely from two regions, the Sudbury district in northern Ontario and the French penal colony of New Caledonia. In early years New Caledonia was somewhat in advance, but in 1903 Sudbury passed it in production and seems likely to hold its position in the future. The mines are all situated round the edge of a basin-shaped sheet of eruptive rock 37 miles long and 15 broad, and among them the Creighton is the greatest nickel mine in the world, supplying more than half of the total output. About half as much copper as nickel is produced in these mines and also small amounts of gold, palladium and platinum, the last metal occurring in the rare arsenide sperrylite, first found in the district. In 1915 matte smelted from the roasted ore contained 34,000 tons of nickel, mostly mined and treated by the Canadian Copper Company, though the Mond Company of England was of some importance, also. The value of the nickel in the matte was placed at $10,352,344, while the refined metal was estimated to be worth $20,423,348. The demand for nickel steel for war purposes has greatly helped the industry.

Copper.— Copper has been mined in Newfoundland, Nova Scotia, New Brunswick, Quebec, Ontario and British Columbia, but only the last two provinces are important producers. The copper of Quebec is a by-product of the iron pyrites of the Eastern Townships; and most of the copper from Ontario is, as shown above, produced as an accompaniment of the Sudbury nickel ores, though mines of copper alone are worked on a small scale at Massey in western Ontario, not far from the once well-known Bruce mines, north of Lake Huron, which were prosperous half a century ago but are no longer in operation. British Columbia supplies more than three-fourths of the copper mined in Canada, chiefly from the gold-copper ores of the Rossland region, the large low grade deposits of the boundary districts and of the Pacific Coast of the province, while a small amount comes from the White Horse district of Yukon territory. The total production of copper in the Dominion in 1915 was 51,306 tons, valued at $17,726,307. The demand for copper for war purposes has greatly increased the production.

Lead.— Almost the whole of the lead mined in Canada comes from the silver-lead ores of southern British Columbia, which began to be opened up extensively in 1893 and furnished 31,500 tons in 1900. Since then there have been great fluctuations in the amount mined, which was 22,184 tons in 1915, the production depending largely on the prosperity of the silver mining industry, since the two metals occur together.

Cobalt.— The whole of the cobalt produced in Canada, and practically all that is used in the world, comes from the silver mines of Cobalt in northern Ontario, where the metal occurs in arsenides, especially smaltite. Though the metal is better suited for plating than nickel, very little is employed in this way. Its chief use is in the preparation of cobalt blue and in giving a blue color to glass or porcelain. In 1914 there was a production of 871,891 pounds of cobalt, mostly disposed of as the oxide, and the value is estimated at about $550,000.

Zinc.— Zinc ores, chiefly blende, have been mined in Quebec, Ontario and British Columbia, and have been shipped to the United States or to Belgium for treatment, but the recent high price of zinc, due to the European War, has encouraged two companies, one at Welland, Ontario, the other at Trail, B. C., to produce the metal from its ores. In 1915 15,553 tons of ore were reported, mainly from British Columbia, and the value is given as $636,204.

Iron.— In regard to the most important of all metals, iron, Canada is backward, largely from the fact that the ore deposits and the fuel for treating them are generally widely sundered. Nova Scotia, Quebec and Ontario have been producers of iron and steel, the first province having the great advantage of supplies of coking coal on the seaboard, at Sydney in Cape Breton Island and other points, so that two large iron and steel plants are in operation there. Most of the ore smelted is, however, in a sense foreign, coming from Bell Island, off the coast of Newfoundland. The province of Quebec has for generations smelted a small amount of bog iron ore in charcoal furnaces near Three Rivers, the product being of high grade and used for special purposes, but since 1912 these furnaces have been shut down. Charcoal iron furnaces were operated on a small scale in different parts of Ontario, also, from 50 to 100 years ago, but when railways began to bring in British iron the industry ceased. Within the last few years large furnaces using American fuel and in part American ore have sprung up at Hamilton, Midland and the Sault Sainte Marie.

Deposits containing millions of tons of fair grade ore have been found in Hutton township, Michipicoton and other points in northern Ontario in rocks similar to those of the great iron regions of Michigan and Minnesota, so that iron production is likely to increase in the future. British Columbia also possesses large deposits of iron ore and excellent coking coal, so that an iron industry like that of Nova Scotia may be expected to grow up as the province becomes more populous. The amount of pig iron smelted in Canada in 1915 was 913,719 tons, of which Ontario produced more than half, but of this amount only 158,598 tons came from Canadian ore, the rest coming from American or Newfoundland ore. The amount of steel produced was 1,020,335 tons.

Platinum and Palladium.— Among the rarer and more precious metals it is perhaps worth while to mention platinum, which has been obtained from placers in the Similkameen region, B. C., and which occurs also in the form of the arsenide, sperrylite, in the Sudbury nickel ores. A few hundred ounces of the metal have been obtained annually as residues after the separation of the nickel and copper in the Bessemer matte from Sudbury. The way in which palladium occurs in the nickel ore is unknown, but it is obtained in larger amounts than the platinum.

NON-METALLIC MINERALS.

Twenty-two non-metallic minerals are reported in the statistics for 1915, and several others occur in lists of former years, but attention may be confined to a few of the more important ones, beginning with the mineral fuels.

Coal.— In 1915 the coal mined in the Dominion amounted to 13,209,371 tons, valued at $31,957,757. Of this Nova Scotia supplied 7,429,888 tons, Alberta 3,320,431, British Columbia 2,089,966, New Brunswick 236,940, Saskatchewan 122,422, and the Yukon territory 9,724. The coal supply of the great manufacturing province of Ontario comes entirely from the United States, and much of that used in Quebec is obtained from the same source; but as a small offset Nova Scotia exports coal to the New England States, and British Columbia to the Western States, the total amount being 1,766,543 tons. The coal of Nova Scotia is bituminous and of Carboniferous Age; most of the coal mined in Alberta and British Columbia is bituminous, also, but of Cretaceous Age. A small amount of coal approaching anthracite is mined in Bow Pass, where seams of Cretaceous coal have been nipped in during mountain building; and a considerable tonnage of lignitic coal and of lignite of poorer quality is mined at numerous points on the prairies. In general the older the deposits and the more they have been disturbed in the rise of the foothills, and especially of the mountains, the better is the quality of the coal.

Excellent coke is made from the coal of Cape Breton Island, Nova Scotia, and of the Crows Nest region of Alberta and British Columbia, and also of Nanaimo on the Pacific Coast, the amount in 1915 being 884,555 tons.

Though Canada is surpassed in the extent of its coal deposits by only two or three countries in the world, their distribution, mainly in the foothills and mountains of the West, leaves the populous central provinces and the largest cities mainly without a native coal supply.

Petroleum and Natural Gas.— At present Ontario is practically the only producer of petroleum, which comes from a small area in its southwestern peninsula. Crude oil and its products to the extent of 215,464 barrels valued at $300,572 are reported in 1915, but the supply is slowly diminishing and before long will be exhausted unless other pools are struck. Petroleum is known from Gaspe in Quebec and from southern Alberta, and great stretches of "tar sands" along the Saskatchewan and Athabasca suggest oil deposits, though productive wells have not been sunk in these regions. See PETROLEUM INDUSTRY, THE.

Natural gas has been exploited in Essex and Welland counties of southwestern Ontario. In 1915 the wells of Ontario furnished gas to the value of $2,202,523. Natural gas is obtained on a large scale in Alberta, especially near Medicine Hat and between it and Calgary, where the production is valued at $1,037,919; and on a much smaller scale in New Brunswick.

In addition to the mineral fuels just mentioned Canada has large areas of bituminous shale from which oil may be distilled and of peat bog from which fuel may be obtained when the need arises.

MINOR ECONOMIC MINERALS.

After the fuels come several less important minerals, asbestos being the chief one, with an output of 113,115 tons in 1915, valued at $3,491,450. The whole product, which means practically the world's supply, comes from a few mines in serpentine rocks in the Eastern Townships of Quebec. The value of this beautiful silky-fibred mineral depends on the fact that it is an incombustible material which can be spun or woven or felted together into non-conducting sheets. Next in value is pyrites, of which 296,910 tons were mined in the provinces of Quebec and Ontario, having a value of $1,028,678. Gypsum, the raw material of plaster of paris, was quarried mainly in New Brunswick and Nova Scotia, to the amount of 470,335 tons, valued at $849,928. Salt prepared from wells in southwestern Ontario reached 119,900 tons in weight and $600,226 in value. In addition quartz, chromite, white arsenic, magnesite and graphite reached values of over $100,000, and mica, feldspar, corundum, talc and ochres were produced in smaller amounts. The corundum mined in Ontario is used only as an abrasive; the gem varieties, ruby, sapphire, etc., have, so far, not been found.

STRUCTURAL MATERIALS.

Building stone, clay for brick making and marl or limestone and clay for the manufacture of cement are, of course, found in all the provinces; but the greater part of the clay products and most of the cement are manufactured in Ontario and Quebec where the demand for structural materials is greatest. In 1915 5,681,032 tons of Portland cement were made with a value of $6,977,024; and clay products were valued at $3,918,200. Statistics of other structural materials of importance are given as follows: Lime, $1,015,878; sand and gravel, $2,098,683; sand-lime brick, $182,651; granite, $1,634,084; limestone, $2,504,731; marble and sandstone, $365,784. The total value of structural materials is given as $18,712,074.

MINERAL PRODUCTION.

The mineral productions of all kinds sum up to a value of $138,513,750 in 1915, representing an advance of 7.49 per cent over the previous year, but a falling off of $7,121,062 as compared with that of 1913, the year of greatest prosperity. The falling off in 1914 was due to the general collapse of the world's industries because of the war, and one may confidently expect the usual advance in output when peace is restored and conditions become normal again.

The following table, showing the production at five-year intervals, illustrates the rapidity of the increase since statistics have been kept by the Geological Survey:

1886 (first year of statistics)	$10,221,255
1888	12,518,894
1893	20,035,082
1898	38,697,021
1903	63,226,510
1908	85,927,802
1913	145,634,812

From this table it will be seen that the mineral industries of Canada increased the value of their output more than eleven-fold in the 25 years between 1888 and 1913, often nearly doubling in the five-year intervals, an almost unexampled advance. That the rate of increase will be as rapid in years to come can scarcely be expected, but so little of the area of Canada has yet been carefully explored that many important discoveries may be looked for as the great northern regions are mapped and opened up.

Sources of Information.— Statistical information as to the mineral production of the country as a whole may be found in the annual reports of the Geological Survey of Canada, Department of Mines, compiled by John McLeish, and in the annual volumes of the *Mineral Industry*. The mining departments of the provinces of Nova Scotia, Quebec, Ontario and British Columbia also publish annual reports of much value in which information is given as to their special mining industries. The statistical materials for this paper have been largely drawn from these sources.

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43. FISHERIES. Among the great industries of Canada the fisheries stand fifth in the order of value. The farming industry (mainly grain growing) is estimated to yield $500,000,000 per annum; the lumber industry $100,000,000; stock raising $100,000,000; mining

$105,000,000, while the fishing industries are estimated to produce, on the whole, $39,000,000 to $40,000,000 annually. The latest report of the Marine and Fisheries Department, which gives the value for 1916–17, places it at $39,208,378, but when account is taken of the amount of fish consumed by wandering tribes of Indians and Eskimo, with their hordes of fish-eating dogs, as well as the amount used as food by isolated settlers, miners, prospectors, lumberers and sportsmen, and, above all, the employees at the Hudson's Bay Company's posts in the remoter parts of northern Canada, the total amount must be greatly in excess of official statistics.

Completely accurate returns are hardly possible, admirable as the Canadian system of gathering statistics is, so admirable that the late Prof. Brown Goode, head of the United States Fish Commission, declared at a fisheries conference in 1883 that ". . . other countries ought to study it with a great deal of care."

The expansion of the Canadian fisheries since 1870 is sufficiently shown by the figures given below:

1870.........	$6,577,391	1901........	$25,737,153
1876.........	11,117,000	1908........	25,451,094
1880.........	14,499,979	1911........	29,965,433
1890.........	17,714,902	1913........	33,389,464
1893.........	20,686,661	1915........	31,264,631
1897.........	22,783,546	1916........	35,860,708
1900.........	21,557,639	1917........	39,208,378

Number of Boats, Fishermen, etc.— Over 1,300 vessels (valued at $4,961,343) and 40,105 boats, including 12,828 with gasoline engines (valued at $4,829,493), are employed, while the fishing gear used, including nets, lines, lobster-traps, etc., is valued at over $5,690,002. Certain branches of the fisheries have developed in a special degree, such as the salmon canning industry on the Pacific Coast and lobster packing on the Atlantic Coast. The former, embracing about 80 canneries, represents an investment of about $3,000,000, while the Atlantic lobster canneries, in Quebec and the three Maritime provinces, numbering 700, are valued at about $660,000. Smokehouses, curing and refrigerating establishments, in operation, are officially recorded at $4,025,371 in value. In other words, a capital of over $28,000,000 is employed in the fisheries. In three years (1911–14) the total increased by nearly $5,000,000.

The total number of persons engaged either in fishing or in handling fishery products in Canada reaches to over 90,000, of whom 70,000 take part in Atlantic fishery enterprises. On the Pacific Coast 10,000 fishermen follow salmon netting, and 8,000 hands find employment as cannery workers, etc. The inland (fresh-water) fisheries engage a considerable number of fishermen, over 4,000 being employed in the Ontario or Great Lake fisheries, while, in Manitoba and the Northwest territories, 3,000 or 4,000 men take part in the fishing operations.

Seven Fishery Districts.— Seven territorial divisions may be distinguished in a general survey of the fisheries of the Dominion, viz.:

1. The Atlantic division, from Grand Manan in the south to the coast of Labrador, including the Bay of Fundy (8,000 square miles) and the Gulf of Saint Lawrence (80,000 square miles), and characterized by deep-sea and inshore fisheries for cod, mackerel, haddock, halibut, herring, hake, lobsters, oysters, seals and white whales (*beluga*). Annual value, over $14,000,000.

2. The estuarine and inland waters of Quebec and the Maritime provinces, including fisheries for salmon (by stake-nets, drift-nets and angling), striped bass, smelt, shad, gaspereau (alewife); and in the lakes, ouananiche or land-locked salmon, lake trout, togue or lunge, etc. Annual value, nearly $2,000,000.

3. Great Lakes division, including Lakes Ontario, Erie, Huron and Superior, which Canada shares with the United States, the international boundary passing practically through the centre of these vast inland seas, all of which finally empty into the river Saint Lawrence. This complex system of waters, with innumerable subsidiary lakes and rivers, abounds in lake whitefish (*Coregonus*), great lake trout (*Cristivomer namaycush*), lesser whitefish (erroneously called lake herring), sturgeon, pike-perch (doreé or pickerel), black bass, brook trout, maskinongé, pike and numerous carpoid suckers, and bearded catfish. Annual value, nearly $3,000,000.

4. Manitoba and northwestern division, including Keewatin, etc., whose wide expanses of fresh water, such as Lake Winnipeg, Great Bear Lake and Great Slave Lake, yield enormous quantities of whitefish, sturgeon, pike-perch, tullibee (a peculiar lesser whitefish), pike, gold-eye (a true fresh-water herring), large river trout and catfish. Value, inclusive of an extensive "caviare" or sturgeon-roe industry, over $1,000,000.

5. Pacific Interior division, extending from the Okanagan, Kootenay and Arrow waters, in the south, to the Yukon district, in the north, and covering an area of plain, valley and mountain 1,000 miles north and south, by about 500 miles east and west, intersected everywhere by rivers and lakes, and comprising limited fisheries for lake trout, whitefish, land-locked salmon, river trout, grayling and numerous carps or suckers, not identical, for the most part, with eastern species. Annual value probably not exceeding $500,000.

6. Pacific Coast division, the fisheries of which are little developed, if we except the estuarine and coastal salmon fisheries. The various species of salmon, include the blue-black or sockeye, the spring salmon or quinnat, the coho, dog-salmon, humpback and a true salmon, namely gairdner's salmon or steel-head. Skill, or black cod, oulachan (candle-fish), anchovy, herring, sardine, smelt and a great variety of other fishes abound which are not utilized to any great extent. Shark, dog-fish, rat-fish and whale fisheries exist; and there are limited oyster fisheries. The halibut fishery is of great importance and yields upward of $2,000,000 annually. With the shipping facilities provided by the extension of the Grand Trunk Pacific to Prince Rupert, in the vicinity of which port are located the best fishing banks, this fishery will develop greatly in the near future.

7. Hudson Bay and Peri-Arctic division, from Ungava Bay, Labrador, to the Mackenzie River, or rather Herschell Island, Yukon district. Whale, walrus, sea trout, Hearn's salmon (a great spotted trout), the inconnu (resembling a river whitefish), pike, suckers, sturgeon and, possibly, salmon and cod occur in these vast northern waters, of which Hudson Bay alone exceeds the Mediterranean in extent and has

an estimated drainage area of 2,700,000 square miles. The richest whaling grounds in the world are in these remote regions of the Dominion, whose tidal channels, as the late Sir John Schultz declared, "are destined to be the last home of the leviathans which within the memory of living man have been driven from Newfoundland latitudes to the places where their survivors have now sought retreat." Hair-seals of various species and white whales (*Beluga*) abound in these sub-arctic waters, and constitute valuable fisheries; one station, according to Dr. Robert Bell, securing no less than 2,800 of these small whales in one season.

Marine Fishing Grounds: Area, Kinds of Fish, etc.— The waters grouped in this sevenfold manner afford a field, hardly to be surpassed, for the development of extensive fisheries. The grounds where fishing can be remuneratively carried on, off the eastern and western sea-board, embrace a total area of no less than 200,000 square miles, the Atlantic shore being over 5,000 miles in length, while the Pacific shore (British Columbia) exceeds 7,000 miles. On this latter coast, Hecate Straits (20,000 square miles) and the straits between Vancouver Island and the mainland, namely, the straits of Georgia and Fuca (15,000 square miles) afford the most remarkable sheltered fishing grounds in the world, being for the most part shielded from the open ocean, and extending inland as placid fiords and deep, salt-water inlets, the total area of these inshore waters being no less than 40,000 square miles in extent. The Canadian fishing banks on the Atlantic Coast are historic. They stretch from Labrador, Anticosti and Gaspé in the north to the West Isles in the southern Passamaquoddy waters, including famous areas like the Bay of Chaleurs, off Quebec province, Northumberland Straits, off Prince Edward Island, and New Brunswick, and Chedabucto Bay, off eastern Nova Scotia. Between the outer edge of the inshore areas and the deep-sea waters of the Atlantic the feeding and breeding grounds occur for cod, haddock, mackerel and other valued edible fishes. "There is probably no part of the world," said Mr. P. L. Simmonds, the well-known fishery authority, "where such extensive fisheries are to be found, as in the Gulf of Saint Lawrence." Among the series of banks mainly resorted to by Canadian fishing boats are (passing from north to south) Great Bank, Green Bank, Bank Saint Peter, Misaine, Canso, Quero, Howe, Roseway, La Have and Western Banks, apart from the great fishing areas in the open Atlantic, such as the Grand Banks, which are not really in Canadian limits and are indeed mainly exploited by fishermen from more distant countries.

Fresh-water Fisheries.— If, owing to the superficial extent, and, no less, the coldness and purity of the marine waters of Canada, as well as the abundance of natural food, upon which cod, mackerel, halibut, herring, etc., subsist, the sea fisheries rank amongst the best in the world, it may be said of the fresh-water fisheries that they are hardly inferior in these characteristics. The total area of the fresh waters of the Dominion (lakes and rivers) is estimated at 140,000 square miles. From a fishers' point of view the lake systems of Canada may be arranged under five principal heads, namely:

Five Lake Systems.— 1. The maritime lakes, embracing the numerous lakes of Labrador, Quebec and the Atlantic provinces. Certain of these, notably Lake Saint John, Quebec (366 square miles), and the Chamcook Lakes, N. B., are famous for land-locked salmon, so prized for their unique game qualities. Black bass, pickerel or doré, lake trout, red and speckled trout abound in these waters, while Clear Lake, Little Seal, Mistassini and most of the northern lakes swarm with whitefish and sub-arctic varieties of trout.

2. The central lake system, including the Great Lakes (76,562 square miles in total area) and innumerable subsidiary lakes, all utilized for commercial purposes and for sport. The areas and maximum depths of the more important of these lakes are as follows: Superior, 31,200 square miles, 160 fathoms deep; Huron, 23,800 square miles, 145 fathoms deep; Erie, 10,030 square miles, 35 fathoms deep; Ontario, 7,330 square miles, 123 fathoms deep; Lake Nepigon, 1,450 square miles; Lakes Saint Clair and Simcoe, 300 square miles each.

3. The Manitoba and Keewatin system, the principal waters of which are Lake Winnipeg, 9,400 square miles; Lake Winnipegosis, 2,030 square miles; Lake Manitoba, 1,900 square miles; and Lake of the Woods, 1,500 square miles; and in these waters enormous fishing operations are carried on for whitefish, pickerel or doré, sturgeon, pike, etc.

4. The Athabasca and Mackenzie system, extending from Reindeer Lake to Great Bear Lake, the latter lake no less than 11,200 square miles in area, while Great Slave Lake is 10,100 square miles, and others are: Athabasca 4,400 square miles; Reindeer Lake, 4,000 square miles; Woolaston and Doobount lakes, each over 2,000 square miles in extent. These waters have been little fished, excepting by Indians, Hudson's Bay Company employees and the like, but being prolific in whitefish, sturgeon, etc., the development of great commercial fisheries in the near future is assured.

5. The Pacific Interior system from Lakes Labarge and Atlin to Shuswap Lake, and the Kootenay, Arrow and Okanagan lakes near the United States boundary. None of the lakes in this western series are comparable in area to the vast inland seas referred to above; but such waters as Babine Lake (250 or 300 square miles) at the head of the Skeena River, and Stuart Lake and Quesnelle lakes (respectively 100 and 750 square miles in area) at the head of the Fraser River, have an importance wholly disproportionate to their size, owing to the fact that their creeks and tributary streams are the great spawning resorts of various species of Pacific salmon. Whitefish, lake-trout, Pacific trout of various species and grayling occur in these waters.

Rivers of Canada.— Fisheries are also conducted upon the rivers, which almost without exception are abundantly supplied with the most esteemed fishes. Apart from a great stream like the river Saint Lawrence, whose drainage area is estimated to be 367,000 square miles, there are rivers, like the Mackenzie (2,400 miles long); the Great Saskatchewan (1,900 miles); the Churchill and Black rivers (each 1,500 miles); the Fraser (750 miles long and draining 100,000 square miles); the Red River (600 miles), and others like the Peace, Nelson, Albany, Great Whale, Skeena (300 miles); Ottawa (600 miles); Saint John (500 miles). Restigouche, Saguenay and Miramichi; all of which are great rivers, presenting for the most part unsurpassed scenic grandeur, and affording notable sport and extensive commercial fishing. It would indeed be difficult to parallel the Fraser River, with its incredible multitudes of salmon, while the Restigouche and other famous angling rivers emptying into the Atlantic Ocean have no peers in the annals of sport. "Canada," as Professor Elwyn said, "is the paradise of the angler."

Minor Fisheries, Oysters, Smelts, etc.— The shores of Prince Edward Island, New Brunswick and parts of Nova Scotia furnish oysters of unequalled flavor and comestible qualities. Owing to over-fishing and inadequate protection the yield has seriously declined from 70,000 or 80,000 barrels per annum to half that quantity, valued at about $180,000 yearly. On the other hand, such an industry as the smelt fishery, mainly carried on through the ice in December and the early months of the year, has grown from $117,000 in 1881 to over $800,000 in value. These dainty fish, formerly used as fertilizing material on farm lands, are now shipped, four or five thousand tons per season, in a frozen condition, mainly to the United States markets. The estuaries of the Miramichi, Restigouche and other New Brunswick rivers are the centres of this remarkable fishery.

The sturgeon fishery has witnessed a great development recently, and has much greater possibilities before it. This fish became commercially valuable in Canada, first on the Saint John River, N. B., in 1880, when 602,500 pounds were shipped to New York. In four years the catch fell to 126,000 pounds, and in 1895 barely 27,000 pounds were secured; but in Lake of the Woods, and on the Great Lakes, and above all, in the illimitable waters of Manitoba, the Northwest and British Columbia, the sturgeon fishery has received a great impetus during the last five or six years. In 1902 the yield of sturgeon was valued at $173,315, as compared with $90,000 20 years ago. Canada, in the opinion of some authorities, is now one of the chief producers of "caviare," which formerly brought 10 cents to 15 cents per pound, and now sells in the cleaned, partly prepared condition at 90 cents to $1 per pound. Catfish and similar species, as well as eels and coarse fish generally, formerly little valued, are now in demand, bringing to the fisherman from $750,000 to $1,000,000 per annum.

Fishing Bounty.— For the encouragement of the Atlantic deep-sea fisheries a bounty system is carried out, the fund for which ($4,490,882) was provided by the Halifax Award, 1877. The bounties paid annually to vessel-owners, vessel-fishermen and boat-fishermen amount to about $160,000.

Government Hatcheries.— An important adjunct to the natural reproduction of fish aided by close seasons, size, limits, etc., is the artificial culture of fish. Sixty-four hatcheries are in operation. The output of fry in 1916 amounted to 1,624,924,254 and included Atlantic and Pacific salmon, lake trout, brook trout, whitefish, pickerel, or doré, lobsters, etc. Several of the provincial governments also aid in fish-culture to a limited extent.

Scientific Stations.— Three scientific biological stations are maintained by the government for the study and solution of fishery problems. One is situated at Saint Andrews, N. B., another at Georgian Bay, Lake Huron, and the other at Departure Bay, B. C. The staff at all three institutions consists of professors and specialists from Canadian universities.

Bait Freezers and Guano Works, etc.— In order to meet the needs of deep-sea fishermen, who suffer much from irregular supplies of bait, the Canadian government assists in the building and maintenance of bait-freezers at convenient and suitable ports. The incursions of hordes of destructive dogfish and the injury to the fisheries resulting from the dumping of fish offal in the sea have moved the government to start fish waste reduction works at various localities on the coast. Under government management these works purchase dogfish, cod-heads, etc., and convert them into guano and fish oil.

Inspection and Branding of Pickled Fish. — In June 1914, the Dominion government passed an act to provide for the inspection and branding of pickled fish, such as mackerel, herring, alewives and salmon. The object of the act is to bring into use a strong, well-made barrel of a standard size for marketing such fish in; also to raise the standard of curing and grading the fish, so that the cured article may secure the confidence of dealers and consumers at home and abroad and be traded in with advantage to the producer and dealer alike. A staff of competent inspectors carry out the provisions of the act, and if they find the fish cured and graded in accordance with the act, and packed in barrels that are of the standard size and make, a mark in the form of a crown is branded on the side of each barrel of fish so conforming to the act. The brand shows the grade and kind of fish contained in the barrel. It is expected that the pickled fish trade will be greatly extended and its value enhanced by means of this system of inspection.

Inspection of Fish Canneries.— A systematic inspection of all lobster, salmon and other fish canneries is maintained by officers of the Fisheries Department for the purpose of ensuring that the various kinds of fish and shell-fish are canned under proper sanitary conditions, and to prevent the canning of unsound fish.

Fisheries Protection Vessels.— A fleet of 45 vessels of various kinds patrols the Atlantic and Pacific coasts and the inland lakes for the protection and regulation of the fisheries.

Central Administration.— For the administration of fishery affairs a special government Department of Marine and Fisheries was created at Confederation (1867) under a minister of the Crown. A deputy minister and a large staff of inside and outside officials carry out the administrative duties which fall to the Federal authorities. Statistics of the quantities and kinds of fish landed in all parts of Canada are carefully collected by officials of the department and published first in the form of a monthly bulletin and afterward in the form of an annual detailed report. The Dominion expenditure on fisheries, including fisheries protection, amounts to nearly $1,500,000 annually.

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44. MANUFACTURES. The 1911 census of Canada, which affords the latest comprehensive view of Canadian manufacturing, gave the total value of manufactured products in establishments employing five hands and over as $1,165,975,639, and placed a value on the raw materials consumed in the manufacturing process at about half that amount. A postal census of manufactures for the year 1915 shows an annual production over $240,000,000 in excess of the total above quoted. Compared with the beginning of the century, the latter figures reveal a growth of nearly three times in the value of products.* They also effectively reveal the important place which manufacturing has come to occupy within the Canadian economic scheme. Only one other total, that of agriculture, vies with manufactures. From the billion dollars' worth of cereals and animals produced on Canadian farms in 1915 there are, of course, comparatively few deductions to be made an account of raw materials consumed, the allowing for which is one of the vexing problems of statistics of manufactures. It would apparently, however, be safe to say that the manufacturing industry of Canada contributes a new value approaching half a billion dollars annually to the production of the country, a total which places manufacturing an easy second to agriculture in the Canadian industrial organization.

Anything like a detailed description of manufacturing in Canada exceeds the intention of the present article. It may, however, be practicable to run over in a summary way the leading groups into which the industry may be divided. These divisions are necessarily somewhat arbitrary, but perhaps the best initial approach is from the standpoint of the primary extractive industries, whose products it is the function of the manufacturer to turn into the forms required for final use.†

Food Production.— First then with regard to manufactures using Canadian farm products as raw materials. The most important industry under this heading is flour and grist milling which had a production valued at $114,483,924 in 1915, the larger mills being located at points strategic to the grain fields of Ontario and the West. Exports of flour in 1915–16 amounted to $35,767,044 and of oatmeal to $471,298. Bread and biscuit-making establishments reported a total product of $40,772,216.

The butter and cheese factories of Canada yielded a product valued at about half that of the flour mills in 1915, a total which does not include farm-made produce. These are chiefly small establishments owned for the most part by associations of farmers. The majority are in Ontario and Quebec, though the Maritime provinces have a well-developed dairying industry, and rapid progress is being made in the West, where the provincial governments have in some cases operated the plants. Condensed milk factories yielded $3,725,668 in 1915. Exports of butter, once a very heavy item, have decreased in recent years with the great increase in home consumption. Cheese exports, however, have steadily increased, reaching a total in 1915–16 of $26,690,500.

Against the live stock branch of farming may be placed a large meat-packing industry, the total product of which reached $96,789,731 in 1915. Meat packing has increased very rapidly in Canada during the past few years, and there has also grown up an important wholesale fresh meat trade. The latter was practically non-existent in 1900. Soap making, which is usually subsidiary to meat packing, is not so in Canada; the product reached a value of $6,445,939 in 1915. Leather making is more directly associated with live stock; the total Canadian product was valued at $3,654,491 in 1915, most of it, however, from imported hides. The boot and shoe industry, based on the leather trade, had an output of $34,064,696, the city of Quebec being the main manufacturing point. The harness and saddlery output accounted for $8,739,278 more, and gloves and mitts for an additional $1,899,092.

Fruit and vegetable canneries, located chiefly in southern and southwestern Ontario, reported a product of $3,794,922 in 1915. Jams and jellies added over a million to this total, evaporated fruits and vinegar and pickles another million and a quarter each. Starch production exceeded $2,600,000.

The Canadian fisheries (which it may be remarked in passing are potentially the most important in the world, both from the standpoint of area of fishing grounds and the abundance, variety and quality of the catch), are also the basis of a large manufacturing industry. The salmon canneries of British Columbia and the lobster canneries of the Maritime provinces are world famous. Altogether the value of preserved fish products in 1915 was about $15,000,000. There is a large dried fish industry (domestic) in Nova Scotia, which, for two generations, has found its chief market in the West Indies. Factory production in the same district, however, is growing, and is beginning to enter into competition with Gloucester, Mass., and other centres of the cured fish trade. The future of Canada's status in this industry seems assured. See CANADA — FISHERIES (article 43).

The above includes the more important items of "food production," which is one of the stock grouping of manufactures. The chief omissions are the industries whose raw materials are imported into Canada, e.g., sugar. Eight sugar refineries are in operation in Canada, yielding in 1915 a product valued at $37,752,235. Manufactures of cocoa and chocolate, coffee and spices, baking powder, etc., yield a product of $10,278,000.

Wood and Paper.— The lumbering industry of Canada is one of its most historic and picturesque industries, and the unrivalled forest wealth which forms its background vouches for its continuance. It is also one of the most widely diffused of Canadian industries. Southwestern Nova Scotia is important for its sawmilling, though less so than the interior of New Brunswick tapped by the Saint John and Mirimichi rivers. Northern Quebec, the Ottawa Valley, the Georgian Bay district and the territory north and west of Lakes Huron and Superior are the sources of an extensive lumber trade. Northern Saskatchewan and Manitoba have also important timber areas, though dwarfed by the wealth of British Columbia in this respect. The total product which these various sources yielded in sawn lumber, shingles and laths, reached a value of $68,815,472 in 1915; this, however, was under war conditions, which were perhaps more depressing in the lumber trade than in any other branch of industry. In 1911, the output was almost exactly half again as large. Side by side with this initial working up of the raw material may be placed the manufacture of sashes and doors, blinds, boxes and similar products, the output of which in 1915 was over $18,370,604. Cooperage added $1,989,564. A higher grade of manufacture is represented by furniture, the value of which was well over $9,765,339 in 1915; carriages and wagons with a somewhat higher value; musical instruments and materials with a value of $4,500,000; and brooms and brushes with a value of $1,378,828. Cars, car works and car repair shops reported a product of $39,794,379.

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* The rise in prices accounts for perhaps one-third of this increase.

† The statistics which follow are quoted from the 1915 Postal Census of Manufactures. Where the war has produced somewhat abnormal conditions mention is made of the fact.

Wood pulp and paper making may be treated in close connection with lumbering. The total output of both in 1915 was $40,348,000. Paper bags and boxes manufactured in 1915 were valued at $5,350,667, and stationery at $3,306,545.

The printing and publishing trade is scarcely to be linked with the paper industry. It may, however, be noted here as well as elsewhere that the output of Canadian printing, bookbinding and lithographing establishments in 1915 was valued at over $33,000,000.

Mineral Products.— The manufactures which have mining for basis are very important in Canada. It is usual to group iron and steel production by itself. There are over 20 blast furnaces in Canada with a total daily capacity of, say, 4,500 tons. The value of the pig iron product in 1913, a high year, was $16,540,000. Steel ingots and castings went over a million in the same year. Total smelter products (in which the above are included) were valued at $102,000,000 in 1915. Some of the most extensive and distinctive Canadian industries are engaged in iron and steel manufacture, such as the Dominion Iron and Steel Company, the Nova Scotia Steel and Coal Company, the Algoma Steel Company, the Steel Company of Canada, the Canada Car and Foundry Company, etc. Based on the raw materials which these supply is a large and varied industry. Foundry products totalled over $36,736,000 in value in 1915; electrical apparatus and supplies, $18,108,241; iron and steel bridges, $9,611,000; boilers and engines, $8,546,488; brass castings, $7,787,302; wire, $6,280,000; aluminum, $4,071,000; plumbers' supplies, $2,268,800; coke, $4,416,000. Other great industries that may be regarded as in a way subsidiary to this branch are the automobile industry, the production of which with its accessories totalled over $28,000,000 in 1915; and the agricultural implement industry with a total product of over $13,370,000. The latter is perhaps the leading example of a Canadian industry having a market in practically every quarter of the globe.

Cement and cement products were valued at $11,676,000 in 1915; brick and tile at $2,931,575; paints and varnishes at $8,373,746. The cut stone industry had a product of $2,568,491. The glass product was valued at $4,718,000, to which mirrors and plate glass added $1,095,000.

Textiles, Rubber, Liquors and Tobacco.— There remain several groups of manufactures whose connection with the primary industries of the country is not so immediate. Among these is the textile industry. Canadian cotton mills had a product of $20,512,909 in 1915; woolens a product of $12,889,708; while silk and silk products aggregated $1,277,044. The clothing industry associated with these raw materials is also very considerable. Men's and women's factory clothing was approximately $41,000,000 in value; hosiery and knit goods over $16,096,800; hats, caps and furs $7,559,000; and carpets $1,500,000. Dyeing and cleaning establishments valued their total contribution at $3,986,670. The rubber industry approximated $14,500,000 in value of product. Liquors and tobacco is a second important group of this kind. Distilled and malted liquors were produced in Canada to the value of $30,756,000 in 1915, while manufactures of tobacco in all forms aggregated $28,987,250. Tobacco growing has made rapid strides in Quebec and southwestern Ontario recently, and British Columbia is beginning to introduce the industry.

Summing up by provinces, approximately half of the Canadian manufacturing industry is in Ontario, and well over half of the remainder in Quebec. British Columbia stands third with about one-fifth the output of Quebec, while Nova Scotia and Manitoba follow close behind. Saskatchewan has a very slight manufacturing industry, though larger than Prince Edward Island, which stands lowest.

The accompanying tables, showing the number of establishments, number of employees and value of products in certain of the more important groups of manufactures and in the several provinces, will be of interest for purposes of more detailed reference.

MANUFACTURES OF CANADA, 1915, BY PROVINCES.

PROVINCES	Establishments	Capital	Employees on salaries		Employees on wages		Cost of materials	Value of products
			No.	Salaries	No.	Wages		
	No.	$		$		$	$	$
Canada	21,906	1,994,103,272	52,683	60,308,293	462,200	229,456,210	802,135,862	1,407,137,140
Alberta	584	42,239,693	1,242	1,456,574	6,325	3,660,549	21,121,439	30,592,833
British Columbia	1,007	158,636,983	2,376	3,050,303	26,477	12,837,442	42,284,883	73,624,431
Manitoba	840	95,845,845	2,427	3,012,197	17,459	10,650,600	38,513,514	61,594,184
New Brunswick	714	46,290,014	1,482	1,465,384	16,219	7,391,949	21,495,324	37,832,034
Nova Scotia	968	126,539,183	2,330	2,277,622	31,423	14,073,758	37,738,161	70,860,756
Ontario	9,887	956,883,423	27,763	31,460,937	220,016	113,502,779	415,285,954	727,923,274
Prince Edward Island	291	1,906,564	224	120,033	2,132	438,389	1,520,327	2,646,469
Quebec	7,158	548,972,575	14,084	16,723,756	139,224	64,931,720	216,497,844	387,900,585
Saskatchewan	457	16,788,992	735	741,487	2,925	1,969,024	7,678,416	14,162,574

Manufactures of Canada, 1915, by Groups of Industries.

Groups of Industries	Establishments	Capital	Employees on salaries		Employees on wages		Cost of materials	Value of products
			No.	Salaries	No.	Wages		
	No.	$		$		$	$	$
1. Food products	7,072	199,205,254	7,250	7,333,245	55,085	22,026,238	301,618,217	388,815,362
2. Textiles	2,671	126,490,509	5,827	6,462,926	68,624	27,044,812	81,429,429	144,686,605
3. Iron and steel products	851	195,877,015	5,683	6,833,897	53,678	27,267,716	59,207,670	120,422,420
4. Timber and lumber and their remanufacture	3,187	263,588,882	4,707	5,725,475	63,663	28,964,555	59,212,349	123,396,686
5. Leather and its finished products	524	60,269,498	2,279	2,540,270	20,307	10,306,114	45,201,497	71,036,644
6. Paper and printing	1,306	138,544,786	6,247	6,879,560	30,817	18,780,569	29,324,906	74,038,398
7. Liquors and beverages	341	52,283,857	1,016	1,712,503	4,376	2,961,993	10,129,252	34,859,927
8. Chemicals and allied products	255	52,248,588	1,993	2,302,447	10,436	5,413,846	24,930,308	45,410,486
9. Clay, glass and stone products	772	96,376,573	1,269	1,713,189	14,498	8,249,184	10,971,641	27,244,813
10. Metals and metal products other than steel	1,173	174,621,994	2,781	3,418,307	27,011	17,557,632	45,931,080	90,943,278
11. Tobacco and its manufactures	166	23,066,898	1,081	1,445,524	8,532	3,083,000	16,017,707	28,987,250
12. Vehicles for land transportation	464	125,965,499	2,630	2,652,568	34,195	18,637,539	40,547,113	73,878,212
13. Vessels for water transportation	103	12,331,341	270	326,954	5,261	2,467,074	3,035,857	8,419,648
14. Miscellaneous industries	1,437	441,132,723	8,367	9,334,448	47,901	25,934,136	56,324,658	134,268,231
15. Hand trades	1,584	32,099,855	1,283	1,626,980	17,816	10,761,802	18,254,178	40,729,180
Total of groups	21,906	1,994,103,272	52,683	60,308,293	462,200	229,456,210	802,135,862	1,407,137,140

Comparative Statement of the Returns of the Postal Censuses of 1906 and 1916.

Items	1905	1915	Increase	
			Amount	Per cent
Establishments, No.	15,796	21,906	6,110	38.68
Capital	$846,585,023	$1,994,103,272	$1,147,518,249	135.54
Salaries	30,724,086	60,308,293	29,584,207	96.29
Wages	134,375,925	229,456,210	95,080,285	70.76
Value of products	718,352,603	1,407,137,140	688,784,537	95.88

The preceding brief review will serve to show the substantial status that has been achieved by manufacturing in Canada. Two remaining points may be touched upon. Apart from an abundance of raw material, the first requisite in manufacturing is cheap motive power. Canada is well supplied with bituminous coal. The fields of Nova Scotia are extensive, and are cheaply worked, and the product is accessible to Quebec and Montreal by water transportation. Ontario, however, is largely dependent for its coal on Pennsylvania, and in the west a long and difficult haul separates the exceedingly rich deposits of Vancouver Island and the Crow's Nest Pass from the prairie centres. In the other great power factor, however, that on which the future of manufacturing will more and more depend, viz., the «white coal» of water power — there is probably no other country in the world more fortunately endowed than Canada. Practically every large centre from coast to coast has abundance of water power available not only for present needs, but for all requirements within anticipation. Quebec and Montreal tap the resources of the Shawinigan and the Cedar Rapids of the Saint Lawrence; central and eastern Ontario the Trent Valley and the Ottawa; southwestern Ontario has the three great plants at Niagara Falls; Winnipeg the two large plants of the Winnipeg River; Calgary those of the Bow River; while Vancouver has developed the Coquitlam with its 400 feet of head. Altogether there are in Canada exclusive of the Northwest terrritories, the Yukon and the northern and eastern portions of Quebec, approximately 17,750,000 horse power available, this amount including in the case of Niagara Falls and other border powers only the development permitted by international treaties, and excluding the possibilities of storage for the enlargement of present capacities. Of this, considerably less than one-tenth has as yet been developed — two-thirds of the development having been carried out only within the past 10 years. The «Hydro Electric Power Commission» of the Ontario government is perhaps the most extensive experiment in government ownership and operation of an important utility in Canada. In 1915 not less than 73 municipalities and 96,744 consumers were obtaining electric power through this body, whose investments in power development in the six preceding years reached a total of approximately $25,000,000.

The labor factor may be mentioned briefly. A heavy immigration has in recent years maintained the labor supply, and though government encouragement is extended only to agriculturalists and domestic servants, the influx has included considerable numbers of skilled artisans. The census of occupations, 1911, credited 491,342 (98,561 female) «workers» to manufactures, the largest total outside of agriculture. These were further divided as follows: Mechanical 303,471; textiles 20,642; food 45,816; clothing 80,409; other factories 41,000. From the standpoint of organized labor, several of the most powerful unions are among employees of industrial establishments. In the metal trades, 186 unions with a membership of 11,813 exist; in the boot and shoe and clothing trades, 59 unions with a membership of 4,966; and in the printing and allied trades, 91 unions with a membership of 6,614. These unions are "international," i.e., are part and parcel of the similar movement in the United States, though with a Dominion "Congress," which plays much the same rôle in Canada as the American Federation of Labor in the United States. There is a purely Canadian "Federation of Labor," but its following is small. The technical education of labor has made a substantial beginning in Canada and the country is alive to its importance. Its development was the subject of inquiry by a royal commission of seven members, appointed in 1910, who after two years' investigation brought in a comprehensive scheme for Dominion and provincial co-operation.

Historical Sketch.— The Canadian manufacturing industry may be said to have been born of the protective tariff of 1878. There were manufactures, of course, before that date. Iron working had been an industry in Quebec from the days of Frontenac, and the shipbuilding yards of New Brunswick were famous half a century ago the world over. Prior to Confederation, however, the greater opportunities and more imperative tasks of agriculture forced manufacturing into the background, and such industries as arose were small and catered to local markets. Flour mills and saw mills were the most numerous; tanning also was a flourishing industry. The woolen mills of Ontario in these early days were of considerable relative importance. In 1876, however, it was still possible for a captain of industry to declare that "there isn't a manufacturer of us all who has not come up from five dollars." To this phase the tariff of 1878, which banished the policy of "incidental protection" and aimed to found a well-rounded manufacturing industry, was the end. A notable expansion set in with 1879 and lasted until 1882, after which the general stagnation accompanying the fall of prices told unfavorably. The "national policy" (as the protective scheme of 1878 was styled) may, however, be said to have doubled the extent of the industry within about a decade. It was not until after the end of the century that a like forward movement was repeated. Throughout the nineties, in fact, manufacturing no more than held its own, employing fewer wage-earners and paying out less for labor, though showing a gain in capitalization and value of products. With the opening of the 20th century, however, this was rapidly overcome. Manufacturing within a decade nearly trebled its capitalization; increased the number of its employees by one-half; considerably more than doubled the amounts paid out in salaries and for raw materials, and increased the value of its product from $481,053,375 to $1,165,975,639. A strong tendency toward specialization and merger made itself felt after 1907, over 40 combinations having been made in the three years 1908, 1909 and 1910; it passed away, however, rather quickly, not having proved the success that was expected. The general expansion continued during 1911 and 1912, but sank back with 1913, being revived, though in a new direction, by the heavy orders for war materials that came from Europe shortly after the declaration of war in August 1914.[*] In the remarkable story of expansion, therefore, which constitutes the history of Canada during the 20th century, and which had its basis in the opening up of the Canadian west to agriculture and the building of railways on an unprecedented scale as feeders of the new territory, manufacturing contributes one of the most important chapters. With the growth of western agriculture the claim of the Canadian manufacturer to special favors under the tariff has been challenged with more insistence than previously. Independently of fiscal policy, however, which has shown no tendency to fundamental change, it may be predicted with assurance that manufacturing will play an important rôle in Canadian development, and that in many lines of products Canada bids fair to become one of the world's growing sources of supply.

R. H. Coats,
Dominion Statistician and Controller of Census, Ottawa.

45. WATER POWERS. Some years ago the late T. C. Keefer, C.M.G., a distinguished Canadian engineer, in a presidential address before the Royal Society, described the water resources of Canada in the following words:

> "An examination of any good map of our broad Dominion, reveals, as its most striking feature, an extraordinarily wealthy and remarkably uninterrupted succession of lakes and rivers, suggestive of ample rainfall, the first great requisite in the occupation of any country. Over a length of several thousand miles, between Labrador and Alaska, and over a width of several hundred miles, there is an almost continuous distribution of lakes, lakelets and rivers; the lakes of varied outlines, dimensions and elevations above sea-level, and many possessing facilities for the storage of their flood waters. In many places the outlet from the lake or the connection between a chain of lakes is a narrow cleft in rock where an inexpensive dam will hold back the water supplied by the winter's accumulation of snow."

These words were written shortly after the first successful transmission of high voltage electricity had opened a new era to water power, and they were designed to emphasize the fundamental advantages that Canada possessed under the new régime. Even in the days of the first Canadian settlers, however, when the harnessing of Niagara would have seemed the wildest of dreams, the earliest manufactures were prescribed by water power, and it was not until the late seventies that the water-driven saw mills and flour mills of Ontario ceased to occupy the premier place in the Canadian industrial scheme.

It would be easy, of course, to exaggerate the importance of water power and of Canada's wealth in that particular. Thus, though the Dominion has a water area of 125,755 square miles, as compared with only 52,630 square miles in the United States, many factors must be considered before such figures are taken at their face significance. The development of power is only one of many uses to which the water resources of the country may be put, and these uses include such important ones as navigation, irrigation and domestic and municipal supply. Moreover, water area is not the same as volume of water, and the volume of water is only one factor in water power, the other being hydraulic head, or the vertical distance through which the water falls.

Nevertheless the resources of Canada in

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[*] Up to 1 June 1917, the Imperial Munitions Board alone had forwarded war materials to the value of $510,000,000 to the government of the United Kingdom from Canada.

this respect are so great as to make moderate statement difficult. Within the nine provinces of the Dominion, excluding the Northwest territories and the northern and eastern portions of Quebec, it is estimated that 17,746,000 horse power are available. Of this amount,— including in the case of Niagara Falls and other international streams only such development as is permitted by treaty, and taking no account of the increases that would be rendered possible by storage,— fully 8,000,000 horse power are readily available to present markets.

Not more than one-fifth of this latter total and less than 10 per cent of the whole has been developed up to the present. By provinces, the record is as follows:

	Developed horse power
Nova Scotia	21,412
New Brunswick	13,390
Prince Edward Island	500
Quebec	520,000
Ontario	789,466
Manitoba	56,730
Saskatchewan	45
Alberta	33,305
British Columbia	265,345
Yukon	12,000
Total	1,712,193

Of the above, about 75 per cent goes to the production of electrical energy, and over half the remainder to pulp and paper manufacture.

It is impossible within brief space to describe in any detail the progress that has been made in bringing this great asset into the service of the community. It will be of interest, however, to run over the several districts into which the country may be divided from this standpoint, noting in each the main developments and the promises that the future holds out.

The Maritime Provinces.— Coal, timber and fish rather than secondary production are the industries for which the Atlantic provinces are known. The land area is not extensive and it is so cut up by the sea that with one or two exceptions no large river systems exist, while the smaller streams are tidal for considerable distances inland. Offsets, however, are found in the heavy rainfall and in the dispersion of water power sites, most of the seaports, where industrial activity may be expected to increase, having water powers in close proximity. Upon the whole, therefore, the power equipment of these provinces is considered satisfactory for present and future needs, though the latter include the heavy demands represented by the smelting of iron ores on a large scale and a considerable steel industry. Existing developments are mainly of two types: Saw, pulp and paper mills, based on the timber resources of the country; and municipal lighting plants. A few woolen and grist mills driven by water are also found. New Brunswick to date has developed about 13,000 horse power, the largest plant being at Aroostook Falls, where 3,800 horse power is manufactured, for sale chiefly in the State of Maine. Nova Scotia has over 21,000 horse power developed, more than half for the manufacture of pulp and paper; gold mining employs 1,150 horse power in this province. The largest water power in the Maritime provinces and one of the largest sites in Canada is at Grand Falls on the Saint John River, where it is now proposed to instal 80,000 horse power. The Nepisguit is another New Brunswick stream which offers 10,000 horse power for development. The Mersey River in southwestern Nova Scotia has a potentiality of 30,000 horse power, of which only 4,250 is now in use.

Quebec and Eastern Ontario.— Coming to Quebec (where 75 per cent of all the power consumed is water power) and eastern Ontario, five groups of water powers — all part of or subsidiary to the Saint Lawrence River— may be distinguished. The first has the city of Quebec for centre. It comprises the Chaudiere River to the south, the Montmorency and Saint Anne in the near vicinity (whose combined present development of 19,000 horse power operates the tramways and many of the factories of Quebec) and the Lake Saint John region to the north. On the Saguenay, the outlet of Lake Saint John, it is estimated that a continuous supply of 300,000 horse power can be obtained — a supply that could be doubled by storage — whereas on the rivers flowing into the lake several additional hundreds of thousands of horse power are available. The second group is that of the Saint Maurice, which joins the Saint Lawrence at Three Rivers, and which alone offers a potentiality of 650,000 horse power. Two very large plants are already installed; that of the Shawenegan Water and Power Company at Shawenegan Falls, where 155,000 horse power is produced for local manufactures and for Montreal, Three Rivers and other neighboring cities; and that of the Laurentide Company which controls the fall at Grande Mère, with its 300,000 horse power, 12 miles above Shawenegan, and which manufactures 250 tons of paper daily. At La Tuque, 103 miles from Three Rivers, is a third fall of 70 feet, capable of generating 75,000 horse power, of which only 3,500 is developed. A third group has Montreal, the commercial capital and outport of Canada, for central market. In it are included the Cedar Rapids of the Saint Lawrence, which have a potentiality of 160,000 horse power, of which 90,000 is developed by one company and 20,000 by a second. Another 13,000 horse power is available for Montreal from the Soulanges Canal, still another 13,000 from the Lachine Rapids, whilst Chambly on the Richelieu River contributes 20,000 horse power to this favorably situated metropolis. It is estimated that an additional 240,000 horse power can be developed for Montreal as the demand arises. The fourth group is that of the Ottawa Valley, on the Quebec tributaries of which several hundred thousands of horse power remain to be developed, the Gatineau alone having 225,000 horse power, none of it utilized. Further north and west on the Ontario side the Cobalt mines are supplied by the Northern Light and Power Company, who, in a single year, reduced the consumption of coal in the camp from 63,000 tons to 17,000 tons. On the Ottawa River itself 600,000 horse power would be rendered available by the canalizing of the river. Development, however, is at present confined to the large industries of Ottawa and Hull operating at the Chaudière Falls and consuming about 36,000 horse power. The rapids of the upper Saint Lawrence may be considered a fifth and last group in this area. They have been utilized only to a small extent for local purposes.

Central and Southwestern Ontario.— The Trent River system is the main supply of central, and Niagara Falls that of southwestern, Ontario. No event in the history of the subject has so appealed to the imagination as the harnessing of Niagara Falls and the employment of its gigantic energy to turn the factory wheels and light the streets and houses of the scores of towns and cities dotting the thickly populated area between Lakes Huron, Erie and Ontario. Under franchises granted by the province of Ontario 405,000 horse power is to be developed at Niagara Falls, 100,000 by the Canadian Niagara Power Company, 125,000 by the Electrical Development Company and 180,000 by the Ontario Power Company. Between 1905 and 1914, 369,000 of this was placed on the market, chiefly in the districts between Toronto and London. Linked with Niagara is the plant of the Dominion Power and Transmission Company at Decew Falls, where 57,000 horse power is developed by drawing water from the Welland Canal and carrying it over the Niagara escarpment, a development which renders possible the operation of an extensive system of radial and street railways in the Niagara Peninsula and lies at the basis of the rapid industrial development of the city of Hamilton. Another international power is that at Sault Sainte Marie, where the Algoma Steel Company and allied industries have developed 17,000 horse power. Returning to the Trent system, about 75,000 horse power is there rendered available by the construction of the canal; of this 45,000 horse power is already in use, the Electrical Power Company having seven plants and supplying a wide territory. The deforestation of southern Ontario and consequent alteration of the regimen of the rivers has greatly reduced the power potentialities of the province.

New Ontario.— The northern and western portions of Ontario are rich in water powers. Of developed works, that of the Canadian Copper Company at Spanish River (10,000 horse power) and that of the Kaministiquia Power Company at Kakabeka Falls near Port Arthur and Fort William (15,500 horse power) are the most important. The Lake Nipigon region and the rivers flowing into James Bay offer perhaps 2,000,000 horse power for future development, only a few thousands being now in use.

The Prairie Provinces.— The two chief developments in the prairie sections of Canada are those on the Winnipeg River, which supply Winnipeg with power, and those on the Bow River, acting as feeders to Calgary. The Winnipeg municipal plant and the Winnipeg Electric Railway Company's plant on the former aggregate a turbine capacity of 79,700 horse power, but this is only a fraction of the total capacity of the river. On the Bow River, the three plants now installed at Eau Clair, Horseshoe Falls and Kananaskis Falls, respectively, yield altogether over 32,000 horse power. The above, however, are merely the first beginnings of power development in western Canada. The North and South Saskatchewan have several important power sites, while the Nelson, with one of the principal drainage areas of the continent, has been estimated to offer no less than 2,500,000 horse power, there being 19 power sites on it, each of which would produce from 75,000 to 235,000 horse power. The Churchill, the Athabaska and the Peace are likewise rivers of great potentialities. For the moment, however, these, like the Nelson, lie beyond reach of a market.

British Columbia.— The "sea of mountains" which constitutes the interior, and the heavy precipitation of a mild and equable climate, makes British Columbia a country of numerous lakes, large and rapid rivers and abundant water powers. The latter early attracted attention. The first development was made 18 years ago at Bonnington Falls on the Kootenay, where 23,000 horse power is now available for the important mining and smelting industries of Rossland and Trail. About the same time the British Columbia Electric Railway Company developed the Goldstream plant on Vancouver Island; but this has been completely eclipsed by the later plants of the same company at Lake Buntzen on Burrard Inlet (being the largest in the province with 84,500 horse power), and at Jordan River on Vancouver Island (25,000 horse power). Other large British Columbia plants are those of the Northwestern Canada Power Company at Stave Lake (26,000 horse power) and of the Powell River Company, Limited, at Powell River, the latter a newsprint establishment generating 24,000 horse power. Altogether over 265,000 horse power has been developed, but it is estimated that there are nearly three times that amount available within market distance of Vancouver and Victoria alone.

The foregoing rapid sketch will serve to show the importance both present and to come of the water power resources of the Dominion. Next to their great extent — Canada in this respect standing second only to the United States, and higher than any other country in the world except Norway on a per capita basis — their proximity to leading centres of population will have been apparent. All across the continent the great cities of Canada have at their disposal an enormous supply of the power which is so essential to their future as industrial centres. Another feature which it has been possible to mention only incidentally is the rapidity of the strides with which Canada is now entering upon her inheritance. Of the total horse power at present in use not less than two-thirds have been developed within the past 10 years, whilst a quarter of a century ago it may be said that the present development had not even been begun.

As an evidence of the awakening of public opinion on the importance of water power, reference may be made to the organization of the Hydro-Electric Power Commission of Ontario, whose operations represent the largest effort in Canada in the way of public administration of a national utility. The Commission was created in 1906, largely upon the report of a previous royal commission of inquiry into the possibilities of Niagara power. Public sentiment had become aroused through fear that the only great source of hydraulic power for southwestern Ontario might be exploited in private interests. The Hydro-Electric Commission began by conducting an extensive series of investigations under direct governmental auspices into the power resources of the province. The next step was the vesting of the Commission with powers of administration, under which it at once contracted for supplies of power at Niagara and elsewhere, and constituted itself a great transmission and supplying agency. Within four years over 1,000 miles of transmission lines and over 1,500 miles of telephone lines had been constructed. In 1915, the Commission was supplying 73 municipalities, and its distribution of power from Niagara alone amounted to 63,500 horse power, the number of consumers reaching nearly to 100,000. The investment by the Commission and its customers to date approximates $24,500,000. The outlook is that within a few years these totals will be largely exceeded.

For official information regarding water powers in Canada, application may be made to the water powers branch of the Department of the Interior of the Dominion government, which exercises jurisdiction in the provinces of Manitoba, Saskatchewan, Alberta and in the unorganized territories of Canada. For the provinces, the following officers are in control: Nova Scotia: the secretary of the Nova Scotia Water Power Commission, Halifax, N. S.; New Brunswick: The surveyor-general of New Brunswick, Fredericton, N. B.; Quebec: The chief engineer, hydraulic service, Department of Lands and Forests, Quebec, Quebec; Ontario: The Deputy Minister of Lands, Forests and Mines, Toronto, Ontario; also, the secretary of the Hydro-Electric Power Commission of Ontario, Toronto, Ontario; British Columbia: The comptroller of water rights, Victoria, B. C.

R. H. Coats,
Dominion Statistician and Controller of Census.

46. COMMERCE, TARIFFS AND TRANSPORTATION.

Early Trade Relations.— In their earlier condition the various provinces of British North America, now forming the Dominion of Canada, were all alike subject to those general laws which embodied the principles, if not always the practice, of the British colonial system. Owing, however, to variations in location, natural resources and the character of the inhabitants, the commerce and tariffs of the various provinces were more or less adapted to their special conditions.

Before the conquest of Canada the Maritime provinces, under the general name of Nova Scotia, were valued as a market for British goods and as a field for the furnishing of naval supplies, chiefly sailors, fish and timber. Nova Scotia's trade was almost entirely developed in connection with New England and the West Indies. Trade with French Canada was illegal, on both sides, and for the most part unprofitable, except for furs in exchange for British manufactures. It was but natural, therefore, that after the conquest of Canada and the independence of the United States, Nova Scotia should still continue to trade chiefly with the New England States and the West Indies, and only to a limited extent with Canada.

Owing to their extensive coast line and numerous harbors, New Brunswick being also well supplied with river navigation, the question of transportation was long a simple one for the Maritime provinces. For Canada, the Saint Lawrence and its tributaries had always furnished the great highway of the country. But above Montreal the river was greatly obstructed by rapids, hence the trade to the West was first developed along the easier Ottawa route, which passed by way of Lake Nipissing to the Georgian Bay. There it followed the sheltered northern channel and the Saint Mary River, with a portage at Sault Sainte Marie, up to Lake Superior, and on, by numerous lakes and streams, to the vast Indian country beyond.

The coming of the Loyalists, the first settlers in what is now the province of Ontario, rendered necessary a regular traffic up the Saint Lawrence and along the lower lakes. From Montreal to Prescott and Kingston this traffic was carried on by means of various forms of large flat-bottomed boats, known as bateaux, which were towed up the rapids, later with the aid of horses. These bateaux brought up limited supplies of European imports, chiefly British goods, and took down the furs and, so far as their space would allow, the potash and flour of the Western settlements. The Revolutionary War had led to the building of the first British vessels on the lakes. After the peace, several of these became trading vessels and others were built, the number steadily increasing with the growth of the Canadian and American settlements on either side of the lakes. The presence of lake vessels diverted the greater part of the Indian trade from the northern to the southern route.

At first most of the surplus produce of the Western settlements found a ready local market in supplying the temporary needs of new settlers, and in furnishing provisions for the Indian posts and the British garrisons. With increasing crops, however, there soon arose a necessity for export, especially of such articles as wheat, flour, peas, salt meat and various minor provisions. About the beginning of the 19th century the amount of provisions produced in western Canada was nearly equivalent to the amount purchased by the British government for consumption at the garrisons and posts. In 1801 the total exports of Canada amounted to $4,800,000. This growing trade required a more extensive and economical means of conveyance than that afforded by the bateaux. A trade in staves and various forms of timber having developed about the same time, and being sent to market in the shape of rafts, these were utilized to convey such provisions as might suffer a little exposure. Large square scows were also built for the purpose of taking provisions to market in bulk.

As regards tariffs and trade regulations in the earlier Colonial period, nothing was left to the provincial authorities; all was regulated by British statutes and administered by Imperial officers. In the matter of taxation, after the American Revolution the British North American colonies had little to complain of, for instead of being taxed to assist Britain the British people were taxed to assist the colonies. In return for her freedom to determine the commercial policy of the colonies and to appoint their officials, Britain had to meet their deficits, besides furnishing the whole of the naval and military services.

The first important change in Colonial commercial relations resulted from the recognition of the independence of the United States in 1783. Pitt and Shelburne had desired to continue practically the same commercial relations with the late colonies after the separation as had existed before it, considering that political independence did not alter the value of a profitable mutual trade. Technically, however, such a policy would do violence to the whole commercial and colonial system, including the Navigation Acts,— the system of "ships, colonies and commerce," upon which the whole British empire was supposed to rest — and this could not be permitted.

Canadians were for a long time too completely absorbed in questions connected with the control of their internal affairs to be much concerned with the fiscal policy of the country. Indeed they rather looked upon Britain's control of the fiscal policy as a means of obtaining increasing assistance from the mother country. The earlier tariffs were simple affairs, the revenue being derived chiefly from duties on spirituous liquors and the molasses from which rum was distilled. The sweeping prohibitions of the Navigation Acts simplified matters very much. There was no trouble with foreign European goods, because they were forbidden to be admitted to the colonies even in British ships, except when they had passed through British ports. It was in Britain, therefore, that the tariff dealt with them and qualified them for entrance to the colonies. In the matter of spirits and such things as were dealt with in colonial tariffs, a variety of preferential duties favored the more as against the less direct trade with Britain and the colonies. After the granting of representative legislatures in the colonies (1791 in Canada) they were permitted to impose customs duties on imports, for revenue purposes only. The right of disallowance exercised by the Crown prevented any unfavorable treatment of British goods.

By the Act of 1778 the British Parliament maintained and freely exercised the right to regulate, by tariff or other restrictions, the commerce of the colonies, but explicitly stated that all revenue incidentally obtained, after paying the expenses of its collection, should go to the treasury of the colony in which it was collected. There was thus a double jurisdiction in the matter of tariffs, the Imperial and the colonial. But, so far as the colonial and Imperial tariffs covered the same ground, only the colonial tariff was enforced. The Imperial tariff applied only where its rate of duty exceeded that of the colonial. The colonial tariff looked only to revenue; the Imperial tariff to the regulation of commerce in the interests of Imperial trade.

The first legally recognized trade between the United States and Canada was provided for in the Quebec Ordinances of 1787–88, which permitted the free export of all goods except furs and peltries, and the import of all forms of timber and naval stores, all kinds of grain and other natural products, and settlers' effects. Rum, spirits and manufactured goods were entirely prohibited, but in 1790 pig iron was added to the list of permissible imports. Pitt's commercial treaty with the United States in 1794 greatly promoted trade between the British American provinces and that country. In this he partly realized his earlier idea of permitting a free mutual trade in all ordinary goods between the United States and the British colonies. But, in deference to the Navigation Acts, so far as the trade was conducted by sea, it must be in British ships. A direct trade to the East Indies was also permitted to the United States. Later this led to several important relaxations of the British colonial policy.

The trade relations of the Maritime provinces, as we have seen, were well established before the United States secured its independence, but, while the United States enjoyed great freedom of trade with all countries, the Maritime provinces still remained under the close restrictions of the Navigation Acts and the colonial system. Thus general merchandise, even British and East Indian goods, was cheaper in the United States than in the British American ports. As a natural result there was extensive smuggling along the coasts of Nova Scotia and New Brunswick, and especially among the islands of Passamaquoddy Bay. American vessels supplied the colonists with liquor, tea, tobacco, molasses and other East and West Indian produce, and the chief lines of European and American goods. They received in return furs, fish, lumber, grain, etc., which they carried to their own ports and to the West Indies. Thus the restrictions designed to give Britain a monopoly of the colonial trade and shipping worked to the opposite purpose. Plainly the system had either to be given up or enforced by quite drastic measures. On the death of Pitt the latter policy was adopted, beginning with the Orders in Council, which in turn induced the non-intercourse policy of the United States, and ultimately the War of 1812–15.

While disastrous to the West Indies and most injurious to Great Britain, yet the troubles between Britain and the United States were immensely profitable, for the time being, to the British North American colonies. To ensure the carrying of the West Indian supplies in British ships, American produce was collected in ports of the Maritime provinces and in Canada, where it might be taken by sea in either American or British vessels, by overland transport or by inland navigation. This stimulated the trade and shipping of the Canadian and Maritime provinces and enriched the colonial produce dealers. The ultimate benefit, however, of these and later abnormal conditions was more than doubtful. After the Peace of 1815, Canada suffered a severe reaction, emphasized by an unfortunate land and immigration policy.

The enormous preference in the British market on British North American timber, which had been built up during the Napoleonic wars, was retained and developed because it enriched British shipowners and timber merchants. By the new Corn Law of 1815 a preference was granted to Canadian grain, but it was very uncertain in its operation, since the grain was not admitted at all until the price had risen to quite a high level, in the case of wheat to about $2.10 a bushel.

The international restrictions necessary to preserve a fair equality for British shipping, under the disadvantages of her colonial system, involved further trouble with the United States. Britain admitted a reciprocal shipping trade between the home country and the United States, and between her colonial possessions and the United States in the inland waters of North America, but denied corresponding reciprocity by sea between the United States and her American colonial possessions. In 1818 the United States retaliated, and direct trade with the West Indies was again suspended. Halifax in Nova Scotia and Saint John in New Brunswick were then made free ports for American vessels bringing certain lines of goods necessary for the supply of the West Indies. In 1823 American vessels were admitted to the colonial trade generally, for all direct dealings between the United States and the colonies. Once more the trade of the Saint Lawrence languished, and complaints poured in upon the home government.

In 1825 Mr. Huskisson, who had revived the policy of Pitt, sought to promote freer trade in America. But he found it impossible as yet to grant perfect reciprocity in shipping. Differential duties were imposed in favor of British shipping in the trade between the United States and the West Indies. The Americans applied the same differentials on their side, and there resulted another period of non-intercourse, from 1826 to 1831, with corresponding activity and prosperity for the Saint Lawrence route and the British North American ports. By admitting to the colonies provisions from the northern nations of Europe in their own ships, Huskisson managed to prevent the Americans from forcing his hand. They came to terms in 1831 and normal trade was once more resumed. But by this time the Colonial System was badly shattered, and almost the only thing left of the Navigation Acts was the British monopoly of the domestic shipping of the empire. The way was being gradually prepared for the final stroke of colonial economic emancipation.

In 1825 Huskisson weakened the corn laws by greatly increasing the preference on Canadian wheat. Regardless of the local price, Canadian wheat was to be admitted at a uniform duty of five shillings per quarter. For a time the exports of wheat were greatly stimulated, but the benefit was not permanent, and the cry for additional preferences was soon resumed.

The prosperous period of 1826–31, augmented by large expenditures on Canadian public works and an increased emigration, continued for a couple of years after the resumption of normal relations with the United States. But trade depression and political troubles brought Canada to a very low ebb in 1837–38. In 1841 the two Canadian provinces were united, and their political freedom was greatly enlarged and trade revived.

In 1843, after urgent petitions, which more or less coincided with the rising demand in Britain for free food, Canada obtained the ominously liberal concession of access to the British market, at the nominal rate of one shilling per quarter, for all the flour she could grind from her own, or imported American wheat, while the corn laws still stood against the rest of the world. Bad harvests and higher prices in Britain tended to enrich the Canadian merchants and millers, but precipitated the repeal of the corn laws in 1846, and the adoption of a free trade policy generally.

Free trade carried with it important changes for Canadian commerce, tariffs and transportation. The preference on Canadian grain had gone, and the preference on British North American timber soon followed. In 1847 Britain renounced the right to regulate Canadian trade, and in 1849, by the final repeal of the Navigation Acts, she gave up her monopoly of the domestic carrying trade of the empire. The general result was that the colonies were left to face the world on much the same terms as other countries. Though lacking in the experience which breeds prudence, those interests which had not been specially pampered entered upon their new career with much zest and enterprise, tending sometimes to rashness.

Canal Building.— At this stage questions of transportation began to be of vital importance to Canada. After the War of 1812 attention had been directed to the necessity for improving the Saint Lawrence route between Montreal and the lakes. A canal to surmount the Lachine Rapids had long been talked of and even abortively attempted. Finally, in 1821, the work was seriously undertaken by the government of Lower Canada, and completed in 1825. This was the year of the opening of the Erie Canal, which, coming at the beginning of a decade of unusual expansion and prosperity for the lake regions, proved a phenomenal success, commercially and financially. This gave an immense impetus to canal building in Canada and the United States. Canals, instead of building public debts, were to abolish them and support States and provinces without taxation. See CANALS.

In 1824 the Welland Canal was undertaken by a joint stock company with a capital of only $150,000, mostly subscribed in the United States. After many vicissitudes and appeals for both Imperial and provincial assistance, it was opened for traffic in 1832. The locks were of wood, 100 x 22 feet with 7 feet of water. However, neither the Lachine nor the Welland Canal could be of much more than local importance until the remaining Saint Lawrence rapids were surmounted. This task the Imperial government was prevailed upon to undertake. But, in doing so, it disregarded all commercial considerations and followed a short-sighted but very round-about military idea. The Rideau Canal was the result, extending from Kingston to Ottawa, which was afterward connected with Montreal by improvements of the Ottawa River navigation. The locks as constructed were 134 x 33 feet with 5 feet of water. It was opened in 1832 and cost the Imperial government about $4,000,000, or between six and seven times the original estimate. Though of necessity carrying considerable traffic, it soon proved that it was not to be a commercial success, since it could not compete with the Erie Canal and did not even supersede the bateaux on the Saint Lawrence. The Upper Canadian legislature determined to complete the Saint Lawrence system and the Cornwall Canal was begun in 1834. But the financial crisis and political troubles of 1837 suspended operations.

The union of the provinces in 1841 brought with it an Imperial guaranteed loan for $7,500,000, with which to complete the public works already planned and partly undertaken. The Welland Canal was taken over by the government and reconstructed. The new locks were 150 x 45 feet, with 9 feet of water, afterward increased to 10½ feet. These were smaller than the locks of the Cornwall Canal, which were 200 x 45 with 9 feet of water. The latter was opened in 1843. The Beauharnois and Williamsburg canals completed the Saint Lawrence system. They were built on the same scale as the Cornwall Canal, and the last lock was opened in 1847. The completing of these canals necessitated the enlargement of the Lachine on the same scale, which was completed in 1848. Thus, in 1849, after the expenditure of upward of $20,000,000, the new Canadian canal system was prepared to accommodate vessels drawing nine feet of water, and Canada expected to realize her eagerly awaited control of the growing traffic of the great basin of the lakes.

But many changes in commerce and transportation had taken place between the opening of the Erie Canal and the opening of the Saint Lawrence system. The British protective and colonial system had been abandoned, and grain from the ports of the United States entered Britain as freely as from those of Canada. Moreover, railways were transforming the carrying trade, making time and continuous service essential features in commerce. While the Canadians were preparing their canals to capture the American carrying trade of the West, the American government was induced, in 1846, to establish the drawback or bonding system. This enabled the American railroads and other transportation companies to make a successful bid for a large share of the western Canadian carrying trade to Atlantic ports. Finally, though after 1849 western produce could be landed at Canadian seaports much more cheaply than at American ports, yet this advantage was lost through higher ocean freights and higher insurance from Canadian ports. The total suspension of shipping for half the year also discounted the natural advantages of the Canadian route, especially in competition with the railroads.

Nothing daunted, the Canadians with their new energy and self-reliance grappled with the changed conditions. On the one hand the government undertook the improvement of the navigation of the Saint Lawrence below Montreal, especially by deepening the channel of the river. The depth of 11½ feet at the time was increased to 18½ by 1860, and has since been increased to 27½ feet as far as Montreal. The navigation of the gulf was also improved.

About 1850 the ocean steamer was rapidly replacing the sailing vessel. The Cunard line of steamers, running to New York and Boston, was subsidized by the British government, doubtless a profitable venture for Britain, but appearing to Canadians as an additional handicap for the Saint Lawrence route. Canada was constrained to subsidize a line of its own,— the Allan — for weekly service, at an annual cost to the country of $225,000.

The American boom in railroad building, and railroad activity, convinced the Canadians that they must have railroads to supplement their canals. They desired independent winter outlets on the Atlantic, and connection with American markets to which the attention of Canada was now turning. While absorbed in their canals the Canadians had given little practical attention to railroads. Hence, before 1840 only 16 miles of railroad had been built, connecting Montreal with Saint John's on the Champlain route to New York. Much discussion took place and many charters were obtained during the forties, but little of a serious nature was attempted. In 1849 the Canadian government, chiefly under the influence of Mr. (afterward Sir) Francis Hincks, adopted a vigorous railroad policy by undertaking to guarantee 6 per cent interest on a sum not to exceed half the cost of any railroad of not less than 70 miles in length. Among the first lines to be undertaken was the Saint Lawrence and Atlantic, connecting Montreal with Portland, and opened in 1853. In western Canada the Northern Railway, from Toronto to Collingwood, was the first to be built, being begun in 1850 and opened in 1853. The Great Western Railway, between Niagara and Detroit, was the next to be undertaken, and was opened in 1854. Under the fostering direction of Mr. Hincks, the Grand Trunk Railroad was chartered in 1852, as the great central line of Canada. In 1853 it leased the Saint Lawrence and Atlantic, and when, in 1856, the main line was opened from Toronto to Montreal, the chief commercial districts of Canada were connected with the Atlantic by a Canadian line.

The railroad boom lasted from 1849 to 1857, involving an immense outlay of capital, chiefly British. Both the central government and the municipalities were deeply pledged in support of the numerous lines undertaken. The crisis of 1857 brought the movement to a close, and the pecuniary embarrassments of most of the lines effectively discouraged further railroad enterprises for the next 10 years. In Nova Scotia and New Brunswick large projects were also afoot to connect Halifax and Saint John with the New England States, and also with Canada. But, beyond small sections of these plans, chiefly for local traffic, little was accomplished before Confederation. The general situation is reflected in the following figures. In 1840 there were in the British North American provinces 16 miles of railroad; in 1850, 66 miles; in 1860, 2,065 miles, and in 1870, 2,617 miles.

Tariffs and Expansion of Trade.— With regard to tariffs, the central feature of the period between 1850 and Confederation, in 1867, was the Reciprocity Treaty with the United States, signed in 1854 and abrogated in 1866. It established reciprocal free trade between the British North American provinces and the United States, in all natural products. This secured free entry to the United States for practically everything which the British provinces had to sell. (See CANADA — RECIPROCITY WITH THE UNITED STATES). The special attraction for the United States was the freedom of access to the Canadian fisheries (q.v.); though the Americans also enjoyed large local markets for agricultural products in many parts of the eastern provinces. According to the statistics of trade, Canada appeared to have the best of the bargain. But the statistics require interpretation. Much of the Canadian export to the United States was really only a transit trade; either the same goods, or their equivalent, being shipped from Atlantic ports. Again, between 1854 and 1858 the decline in the amount of manufactures imported from the United States was due to the financial crisis of 1857 and the cessation of public works in Canada. Then, during the Civil War the United States was extensively purchasing supplies, and had little to sell. The Canadians themselves have been greatly deceived by the figures of the reciprocity period, and imagined that a like result would flow from the renewal of reciprocal trade.

The other feature of importance in this period was the increase in the Canadian tariff on manufactured goods, in 1858 and 1859. Owing to the large public debt contracted for the building of the canals, the interest on which was not offset by tolls as expected, and, more immediately, owing to the great obligations incurred in guaranteeing railroad investments, the Canadian government was in great financial straits after 1856 and was therefore forced to seek a larger revenue. Accordingly, in 1858 the tariff on imports was raised the general rate being increased from about 12½ to 15 per cent, and in 1859 it was still further increased to 20 per cent. The British merchants and manufacturers vigorously protested against such an increase of duties on the goods of the mother country, and the manufacturers of the United States considered the increase of duties a breach of faith, inasmuch as they had expected their advantage from reciprocity to come from the sale of manufactured goods. The Canadian government replied that its sole object was to relieve its financial obligations, not to check imports.

The abrogation of the Reciprocity Treaty in 1866 produced a strong effect upon the British North American provinces and undoubtedly precipitated Confederation. The Canadian tariff of 1866 was lowered to a 15 per cent standard, as a concession to the freer trade leanings of the Maritime provinces, and became the first tariff of the Canadian Dominion. Canada retained the general principles of a tariff for revenue until, in common with other countries, she suffered from the world-wide depression of 1875–78. An effort was made to secure the renewal of the Reciprocity Treaty. This failed, however, and a change of government took place on a promise of relief by means of a protective tariff. This new tariff of 1879 raised the general standard of duties from 17½ to 20 per cent. Times revived throughout the world and the relief promised actually came. The tariff, however, did not prevent the country from suffering with all others during the next period of depression, from 1884 to 1886, though the tariff had been raised somewhat in the interval. Nor did the country escape during the next depression, from 1894-96, when another change of government took place after a general election. The Liberal party being more or less pledged to a reduction of duties, found this more difficult to accomplish than to promise. In 1897, however, the tariff was considerably amended in the interest of the consumer, and the happy expedient was devised of offering to the world at large a reduction of 25 per cent on the general tariff, wherever Canada was treated with equal favor. As Britain was practically the only important country fulfilling these universal conditions, the policy which was entered upon as a redemption of the party pledge ended in the preferential treatment of British goods only. This limitation was explicitly recognized in 1900, when the preference on British imports was increased to 33⅓ per cent. Since, for various reasons, Canadian imports from Britain were declining, relatively at least, this concession did not adversely affect important Canadian industries except in the department of textiles. Accordingly in 1904 this part of the preferential tariff was amended and the duties were raised. At the same time a new principle of maximum and minimum tariffs was outlined for the future.

For a decade and a half after 1897 a steady tide of population and capital set in toward Canada. In a new region such as the virgin plains of western Canada, the new and extensive employment of labor and capital resulted in the most obvious prosperity and radical changes on the face of nature. In planting the wilderness with the homes and busy trade centres of men, a lively market was created for all manner of wares for construction and consumption. Even the wilderness itself soon came to have a highly speculative value, whether in the gross, as prospective farms, or in detail as metropolitan city lots estimated at so much per foot. Thus the investment of one dollar in actual capital called into existence several other dollars of prospective value, and the real and imaginary were exchanged indiscriminately.

Again, the building of modern railroads into unexploited territory is like the letting out of water upon the thirsty earth. Even in the process of construction they irrigate the country with millions of wealth, producing large harvests of profit for contractors and the purveyors of supplies. They afford markets for armies of workmen, and for all manner of machinery, implements and materials of construction and equipment. When completed these agencies of transportation open the wilderness to the home seeker, who, merely as home builder, furnishes them with employment for years, and, as town and city builders, for decades. Soon the speedy returns from agricultural industry furnish the railroads with traffic; alike in the export of bountiful harvests and the import of the implements with which they are to be increased, and the myriad of miscellaneous supplies which the ingenuity of the modern trader brings to the door of the settler with actual or prospective crop returns.

All these features were strikingly realized in Canada between the years 1897 and 1913 and may be illustrated by some typical concrete facts. The immigration from the adjoining agricultural and industrial regions of the United States was very marked during this period. The annual immigration from the United States was but little over 2,000 in 1897 but it rose to 139,000 in 1913. During the same period, the annual immigration from Britain increased from 11,000 in 1897 to 150,000 in 1913. The total annual immigration from all countries increased from 21,000 in 1897 to 402,000 in 1913. The British immigrants as a rule preferred settlement in the towns, while the American settlers preferred the farms, thus indicating the life to which the respective immigrants had been accustomed before coming to Canada.

The natural effect of the modern tendency toward highly specialized production, as applicable to agriculture as to other industries, has enhanced the activities of urban life and reduced proportionately the occupations of rural life. Agricultural machinery and the supplies for the farmers' homes are now chiefly produced in the cities. The rural population of Canada, which amounted to 63 per cent in 1901, fell to 55 per cent in 1911. This decline was marked in all the older parts of the country and even in southern and central Manitoba where the earliest settlements had been made in the West.

The trade of Canada no less than its population testified, not only to the rapidity of the development of the country between 1897 and 1913, but to the fact that this was largely due to the influx of immense volumes of foreign capital, which came almost entirely in the shape of goods and not in the form of money. Thus the total trade of the country, which had stagnated from 1875 to 1895, having increased barely 12 per cent in those 20 years, rose from $224,000,000 in 1895 to $550,000,000 in 1906. In another eight years it had increased to $1,129,000,000, in 1914. It then fell off some $9,000,000 during the first year of the war, but, under the stimulus of war expenditure and munition supplies, rose to $1,447,000,000 in 1916.

Under the influence of the capital investment already referred to, the imports of the country rose much faster during the period of expansion than did the exports. Thus at the beginning of the period of expansion in 1897, the exports of the country exceeded the imports by $18,000,000 on a total trade of $257,000,000. But by 1906 the imports had already exceeded the exports to the extent of $37,000,000, and in 1913 the exports had reached an excess of $298,000,000. These excesses were completely offset by borrowings abroad, much the greater part being obtained in the London market. With the rapid falling off in 1913–14 in the supply of borrowed capital, with a corresponding reduction in capital expenditure, there was a severe shrinkage in importation and a corresponding liberation for export of much Canadian produce hitherto purchased for use in the country itself. This transition was greatly emphasized during the first year of the war, when British capital was practically entirely cut off for all but military service.

This sharp reversal of the movement of the previous decade immediately revealed itself in the trade statistics of the country. The surplus of imports of $298,000,000 in 1913 was reduced to $171,000,000 in 1914, was further reduced to $26,000,000 in 1915 and in 1916 was converted into a surplus of exports of $149,000,000. In the trade returns for the last two years, the export and import of bullion has been eliminated as it was abnormally influenced by financial arrangements between Great Britain and the United States with which Canada had no special concern.

Britain and the United States have continued throughout to be the all-important factors in Canadian foreign trade. Thus Britain is the chief market for Canadian exports, while the United States furnishes the chief source of supply for Canadian imports. The Canadian trade with all other countries combined makes but a relatively small showing in comparison with the trade carried on with either of these two countries. In the decade between 1904 and 1914, out of a total of $2,892,000,000 of exports, Great Britain took $1,447,000,000 and the United States $1,157,000,000, leaving only $287,000,000 as taken by all other countries, including the other sections of the British empire. During the same period Canada imported for home consumption a total of $4,160,000,000, of which the United States furnished $2,601,000,000, and Great Britain $952,000,000, leaving only $605,000,000 as supplied by all other countries, whether within or without the British empire.

Such being the case, the tariff relations between Canada and her two chief customers, Great Britain and the United States, are of chief interest in this field. Until the outbreak of the European War, however, few changes were made in the tariffs applicable to these two countries. Treaties had been negotiated with several of the British West Indian Islands on the basis of mutual preference. As already indicated, however, for the past century and more, many attempts have been made to break the natural trade relations originally established between the West Indies and the Atlantic States when they were British colonies. The British island colonies on the Atlantic Coast are loath to invite unfavorable tariff treatment from the United States by granting special favors to Canadian trade. Hence, while some of the smaller islands accepted the Canadian offer, the larger colonies of Newfoundland, Bermuda, Jamaica and British Honduras declined to respond to the Canadian preference extended to them for three years from 1912.

On the other hand, as regards Canadian tariff relations with the United States, the situation for Canada has considerably improved since the opening of the century. On the one hand, Canadian products have been coming ever more fully into world markets; while, on the other, the increasing population and industries of the United States have rendered the Canadian supplies of raw materials and food products a matter of undoubtedly increasing importance. Further, the Canadian market for American raw material such as coal, cotton, corn, etc., and for many important lines of manufactured goods has been steadily increasing. These changing relations naturally affected the traditional attitudes of the respective countries toward the perennial question of reciprocity. The discussion of this question was renewed in 1910, and, after considerable negotiation, centring around the higher and lower schedules of the Payne-Aldrich tariff, there emerged the reciprocity agreement of 1911, which followed fairly closely the previous treaty of 1854. The new treaty was passed by the United States Congress in July 1911, but was successfully blocked by the opposition in the Canadian House of Commons in the expiring days of the parliamentary term of 1911. The general election which necessarily followed largely turned on this issue, and revealed the strength of the growing Canadian sentiment in favor of maintaining not only political but commercial independence. The existing government was defeated in the election of September 1911. In consequence the treaty was not confirmed and the tariff relations between the two countries remained upon the basis of the ordinary tariff legislation of each country.

Such modifications as have been made in the general Canadian tariff since 1911 have been due to special local interests. The changes introduced since the outbreak of the war have been determined almost entirely on revenue grounds and will be dealt with under the section on Public Finance.

Incidentally to the process of granting preferential treatment to Great Britain, Canada has secured complete fiscal independence, being no longer bound by the commercial treaties negotiated between Great Britain and other countries, unless she explicitly agrees to accept the terms of any treaty. Incidentally to the same process of tariff emancipation, Canada found herself involved in a tariff quarrel with Germany. This lasted for some seven years, from 1903 to 1910, ending in favor of the Canadian contention. During this period most German imports reached Canada as Dutch, Belgian or British goods, and Canadian supplies went to Germany through similar channels.

Of late years Canada has virtually established an independent consular service under the guise of a system of trade commissionerships. They were established at first chiefly with Great Britain and other portions of the British empire, but now extend to several foreign countries with which it is desired to promote direct trade relations. This system is certain to be more fully developed after the war.

Railways.— As a condition of Confederation, in the East, the Intercolonial Railway, connecting the Maritime provinces with Canada, was constructed by the government at a cost of upward of $20,000,000. A corresponding condition of western federation was the construction of a transcontinental line to British Columbia. This was ultimately realized in the Canadian Pacific Railway, begun in 1881 and completed in 1885 at a cost to the country of $62,000,000 in cash and 25,000,000 acres of land.

The rapid development of Canadian railways since 1900 centres upon the actual and prospective needs of the immense inland areas west of the Great Lakes. The need for additional facilities for main line transportation has been largely incidental to the need for extended systems of branch lines for the settlement and development of so extended an area. A solution of the problem has been largely effected, but unfortunately without any very obvious regard to either economy or efficiency. The combination of transcontinental and local service has been attempted, and, so far as construction is concerned, has been largely realized by three independent and competitive systems, the Canadian Pacific Railway, the Grand Trunk and Grand Trunk Pacific Railway and the Canadian Northern Railway. In various portions of the western provinces other more or less independent but chiefly provincial lines have been partially constructed, largely on the basis of liberal financial assistance by the respective provinces in which they are located. Most of the larger railroad extensions in the East, including the government Transcontinental Railway, have been necessitated by the western developments of the three larger companies. Since 1870 the mileage of the railroads has increased as follows: 1870, 2,617 miles; 1880, 7,174 miles; 1890, 13,151 miles; 1900, 17,657 miles; 1910, 24,731 miles; 1915, 35,582 miles.

The total capitalization of the Canadian railways in 1914 was $1,808,820,000, nearly evenly divided between stocks and bonds. In addition the Dominion government has subsidized the railway systems to the extent of $178,834,000 in cash. It also granted to them 31,864,000 acres of land and has guaranteed their bonds to the extent of $127,965,000. The Dominion government has also expended $323,596,000 in building or purchasing certain railroad lines of its own, chief of which are the Intercolonial Railway and the Transcontinental, both built entirely by the government. The provincial governments have subsidized the railroads to the extent of $37,023,000 in cash, and 23,876,000 acres of land, and have guaranteed their bonds to the extent of $107,500,000. To these subsidies must be added the cash contributions of the municipalities, amounting to $17,914,000.

The outbreak of the European War naturally disturbed the calculations of the railroads as to their normal prospects, affecting them both as to their capital financing and their traffic earnings. The results, however, have not always been adverse, since in many lines their earnings have been greatly increased, owing to the exceptional Western crop of 1915 and the great transportation needs incident to the war. All of the Canadian railways, and especially the Canadian Pacific Railway, found the year 1915–16 an exceptionally profitable one. The net earnings of the Canadian Pacific Railway system for that year amounted to over $49,000,000, being more than $15,000,000 in excess of the net earnings of the previous year. At the same time the Grand Trunk Pacific and the Canadian Northern railroads experienced difficulties in connection with their capital financing, which forced them to come to the government for assistance and which it has not been found possible to resist. At present a commission is investigating the whole railroad problem of the country with a view to some permanent reorganization of the internal transportation system of Canada.

Canals.— Confederation also directed attention to the renewed importance of the Saint Lawrence route and the economy of large vessels for the carrying trade. It was determined to enlarge and deepen the canal system. The new movement was once more begun at Cornwall, in 1876. The dimensions of the new locks were 270 x 45 feet with 14 feet of water. The other canals were enlarged or quite new ones constructed on at least the same scale. The Soulanges Canal, the last to be built, has locks of 280 x 45 feet with 15 feet of water. In 1895 a Canadian canal at Sault Sainte Marie was opened with one lock of 900 x 60 feet and with 18 feet of water. There is now, therefore, a continuous waterway with a minimum depth of 14 feet from Lake Superior to the sea.

As usual it was expected that when the new canal system on a 14-foot basis was fully completed, the grain and other traffic from the West would be largely diverted to the Saint Lawrence route. This expectation, however, was but slightly realized, there being many factors to be taken into account, among them the construction of still larger vessels upon the upper lakes and the changed conditions of transatlantic shipping, tending to favor the larger American ports. The forwarding of grain tended to shift from the Saint Lawrence route below Lake Erie to the New York and other transatlantic routes through Buffalo, which, at present, furnishes the chief exit for western Canadian as well as American grain. Still another attempt, therefore, is being made to readjust matters by a further enlargement of the Welland Canal. After elaborate surveys and much discussion, with incidentally a considerable agitation from Montreal and northeastern Ontario for the construction of a new canal route via the Ottawa River and Georgian Bay, it was decided in 1912 to undertake the enlargement of the Welland Canal. This involves widening and deepening the ex-locked section of the canal from Lake Erie to Thorold, and the construction of a new system of seven very large locks from that point to Lake Ontario, serving the purpose of the 25 locks on the existing canal. Ultimately, the new canal will furnish a water way of 30 feet in depth although in the meantime of 25 feet for the unlocked section of it. This will amply accommodate all present vessels from the head of Lake Superior, the Sault Sainte Marie having a minimum depth of only 18 feet 3 inches. The estimated cost of the new canal is $50,000,000, $20,000,000 have been voted and $10,000,000 expended, but further operations are likely to be suspended until the close of the war.

The full benefit of the new Welland Canal for the Saint Lawrence route cannot be realized until the Saint Lawrence River canals from Prescott to Montreal are also enlarged, the present locks on this section ranging from 14 to 18 feet, the majority with the lesser depth.

Meantime, extensive improvements in the harbor accommodation at Saint John, N. B., and the construction of new terminal facilities at Halifax are expected to have an important influence on the transatlantic facilities from Canada, without which the mere improvement of the canals would not be sufficient to influence the present and possibly future trend of Canada's external trade through American ports. See CANADIAN CANALS.

ADAM SHORTT,
Commissioner of the Dominion Civil Service.

47. BANKING SYSTEM. The first banking establishment in Canada was a private bank founded in Montreal in 1792, under the name of the Canada Banking Company, and evidently intended to be modeled after the English private banks. It opened for business and issued notes, but its life was very short. In 1807–08 an unsuccessful attempt was made to obtain from the legislature of Lower Canada a charter for the Bank of Canada, which would have been a semi-government bank, resembling in many respects the first Bank of the United States, though naturally on a much smaller scale. In 1817 the «Montreal Bank» began business in Montreal as a private partnership, this being the origin of the Bank of Montreal, which was for many years, and still in some respect remains, the most important bank on the continent, while from its «Articles of Association» there has been developed, with steady continuity, the scientific system of banking law which exists in Canada to-day. In the following year two similar associations — the Quebec Bank and the Bank of Canada — were formed, on almost identical lines, and in 1822 all three obtained legislative charters of incorporation, valid for 10 years, which followed the articles of association in almost every important particular. They differed very considerably, however, from the abortive bill of 1808. Framed to give legal recognition to associations of merchants already actively engaged in commercial banking, they were throughout designed to meet ordinary commercial requirements, and although they are perhaps more remarkable for what they omitted than for what they included, most of their provisions were sound. They confined the bank's business to legitimate lines, they prohibited lending upon the pledge of goods or upon mortgage, or dealing in real estate, and they provided that all notes issued were to be redeemable on demand in specie. Power to open branches was not expressly given, but as it was not denied, its existence was assumed, and the banks did, as a matter of fact, open branches or agencies in both Lower and Upper Canada. The English private banks and the Scottish chartered banks were the joint parents of these Lower Canadian charters, and of the Canadian banking system which has sprung from them. Various changes and additions were made to suit Canadian requirements, while in the phraseology used, as well as in some of the internal regulations, the influence of the chartered banks in the United States may be seen, but it may safely be said that practically everything which has proved of permanent value was derived from English, Scotch or native sources.

In Upper Canada the earliest banking legislation was on political, rather than commercial, lines, and the first charter, that of the Bank of Upper Canada, granted in 1821–22, followed the Lower Canadian bill of 1808 rather than the articles of association of the «Montreal Bank.» The plan as first adopted was not sound, and as it had little permanent influence upon later legislation no description of it is necessary. The Imperial authorities, by pressure persistently exerted, succeeded in securing the adoption of two important amendments which are still part of Canadian banking law. In 1832 banks were prohibited from holding, or lending on, their own stock, while in the charter of the Gore Bank, granted in 1835, it was provided that the shareholders should be individually liable for the debts of the bank to an amount equal to their respective holdings of subscribed stock. The prohibition of the lending of money on mortgage, which from the first had been embodied in Lower Canadian charters, was never adopted in Upper Canada, although strongly urged by the Colonial Office.

The Union of the two Canadas took place in 1840, and at its first session in 1841 the legislature of the province of Canada adopted the report of a select committee, favoring a uniform system of banking, and approving a number of important regulations emanating from the Colonial Office, some of which already existed in individual charters. All notes were to be payable on demand in specie, they were not to be issued to an amount exceeding the bank's paid-up capital, and suspension of specie payments for a given number of days (not in any case exceeding 60), either consecutively or at intervals within any one year, was to forfeit the charter. The bank was not to hold its own stock, or to make advances against it, nor was it to lend money on security of lands or houses, or ships, or on pledge of merchandise. These and a few less important regulations were incorporated in every new and renewal bank charter thereafter granted, the double liability clause was made applicable to every bank, and one bank was prohibited from holding stock in another, except such as might be taken for bona fide debts, contracted in the usual course of business. In this act we have the first attempt to deal with banking in a systematic way and to lay down general rules to which all banks must conform.

Only a passing mention need be made of

the free banking law which, avowedly an imitation of the free banking laws of the State of New York, was passed in 1850. By 1854 its failure was evident, the free banks gradually died out or obtained charters, and the act was repealed in 1866. The only vestige of it now to be found is the provision, revived in the Dominion Act of 1880, that notes issued by a bank should be the first charge upon its assets.

Up to 1859 banks had been prohibited from lending money upon the pledge of goods, but in that year an act was passed authorizing a bank to take bills of lading, warehouse receipts, etc., as collateral security for the payment of any bill or note discounted by it, providing the security was taken at the time the bill was negotiated.

Little need be said as to the banking history of the other provinces. The charters in the Maritime Provinces were very similar to those of Lower Canada, Manitoba had no existence as a province before it joined the Confederation, while British Columbia had passed no banking legislation, its only bank having been incorporated under an Imperial charter, which has now been surrendered.

At Confederation, in 1867, all right to legislate regarding banking was vested in the Federal government, but the initial task of framing a comprehensive banking law which should be uniform for the whole Dominion was by no means an easy one. Banking experiences during the previous two or three years had not been altogether happy, very divergent views were held, and even among bankers there was a wide difference of opinion, a difference which to some extent followed geographical lines, the existing system being generally upheld in Ontario, while in Quebec and the Maritime Provinces there was a widespread desire for a change. A system which in its main features would have followed pretty closely the banking practice of the United States was in 1869 proposed to Parliament by Mr. Rose, then Minister of Finance, and was strongly supported by representatives of the Bank of Montreal and the Bank of British North America. But determined opposition developed, and the proposals were withdrawn. A new Finance Minister, Sir Francis Hincks, having taken office, an act was passed in 1870, continuing many existing features and introducing some new ones. But the first really important Bank Act passed after Confederation was that of 1871 (34 Vict. Chap. V), which embodied all the provisions of any charter or general act then in force which it seemed desirable to perpetuate, making them applicable immediately to all new banks, and to all the existing banks as soon as their respective charters expired. A few small banks in the Maritime Provinces continued for several years under their old charters, the last one coming under the operation of the act on 1 March 1892. While each bank retained the necessarily individual features of its own charter — those relating to its name, capital, chief place of business, etc. — and while it still remained necessary for every new bank to obtain a special act of incorporation (which it could do as a matter of course during any session of Parliament, if it conformed to the prescribed conditions), the new act made all other regulations uniform, with some unimportant exceptions in the case of the Bank of British North America, which was incorporated under an Imperial charter, and La Banque du Peuple, which has since passed out of existence. Except for the express right given to a bank to make advances on the stock of other banks (a most objectionable enactment, repealed in 1879), no new features of special consequence were introduced. It provided 'that no bank should issue notes of less than $4 each, and that every bank should hold as nearly as practicable one-half, and never less than one-third, of its cash reserves in Dominion notes (both provisions designed to increase the issue of Dominion notes): but the importance of the act rests on the fact that it firmly established in Canada a banking system based upon Canadian and British principles, a system which, modified and improved from time to time, exists in Canada to-day. Its chief features are: large banks, the branch system, an elastic assets currency, no fixed reserves and the double liability of shareholders. In 1879 the Bank Act was revised, and in 1890 it was revised and re-enacted, while an amending act (63, 64 Vict. Chap. 26) was duly passed in 1900, but only two new provisions require mention. Special powers were given in 1900 under which any bank might sell the whole or any portion of its assets to any other bank, and the Canadian Bankers' Association was formally recognized and given certain definite legal powers and duties. For a long time past it had been an established rule to enact the Bank Act for 10 years only, thus ensuring a periodical discussion of the whole theory and practice of banking, while during the 10-year intervals the banks could enjoy comparative peace. A revision of the act was accordingly due in 1910, but at that time the public mind was much disturbed over two or three recent bank failures, and it was therefore deemed best to postpone discussion and revision. But the act of 1900 would expire on 1 July 1911, so in order to keep the bank charters in force the act was extended from year to year until 1913, when it was decided to deal with the matter.

As a result of public feeling, and of a persistent anti-bank agitation which had been going on in some of the newspapers, the whole banking system was subjected to very close and searching criticism. Many radical changes were proposed, some of them meeting with strong support both in Parliament and in the country. But while some important alterations were embodied in the new act, there was no real departure from the principles of the established system, which may be said to have encountered successfully the hostile criticism to which it was exposed. The new act (3-4 George V, Chap. 9) came into force on 1 July 1913 and will expire on 1 July 1923. Until that date it is the charter of every Canadian bank (except a couple of savings banks in the province of Quebec), and under it every bank has exactly similar rights, privileges and limitations*; the Bank of Montreal, with paid-up capital and reserve fund of $32,000,000, and the Weyburn Security Bank, which has a paid-up capital and reserve fund of $535,320, standing on precisely the same legal footing. The minimum subscribed capital necessary before a new bank can begin business is $500,000, of which at least $250,000 must be actually paid up in cash and deposited with the Minister of Finance. After the bank is in operation the shareholders may, by passing a by-law at a general meeting, and afterward obtaining the approval of the Treasury Board, increase or reduce the capital stock, but it must not be reduced below $250,000. Before a bank may begin business it must obtain from the Treasury Board a certificate that it has complied with all the requirements of the law, this certificate to be obtained within one year of the date of the act of incorporation. The Treasury Board is the financial committee of the Privy Council for Canada, composed of five Cabinet ministers, with the Minister of Finance as chairman. No person or corporation may use the word «bank,» or the words «savings bank,» «banking company,» «banking house,» «banking association» or «banking institute,» or any word or words of import equivalent thereto in any foreign language, to describe his business or any part of it without being authorized to do so by the Bank Act or by some other act, nor may he use foreign words equivalent to «banker» or «private banker.» There are now very few private bankers in Canada, and their operations are on quite a small scale. The following tables give the principal items in the combined balance sheets of the banks at different dates since Confederation.

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* An unimportant exception in the case of the Bank of British North America is noted later on.

LIABILITIES (000 Omitted).

31 Dec.	No. of banks	No. of branches		To shareholders			To public		
		Canada	Elsewhere	Paid-up capital	Surplus	Average capital per bank	Notes in circulation	Deposits	Total liabilities to public
1870......	(a) 20	(e)	(e)	$33,449	(e)	$1,672	$18,526	$52,056	$72,494
1880......	(b) 36	(e)	(e)	59,819	(e)	1,661	27,328	90,387	121,471
1890......	(c) 38	(e)	(e)	60,057	$21,940	1,580	35,006	139,701	178,826
1900......	36	(e)	(e)	67,087	34,501	1,863	50,758	325,824	392,150
1910......	28	2,368	57	99,676	83,965	3,559	87,694	926,391	1,036,076
1911......	29	2,570	69	107,995	96,868	3,724	102,037	1,016,781	1,174,323
1912......	27	2,808	76	114,882	106,840	4,255	110,048	1,139,081	1,292,451
1913......	24	3,008	86	114,809	112,118	4,783	108,646	1,141,780	1,308,757
1914......	22	3,130	92	113,917	113,070	5,178	105,970	1,153,196	1,314,646
1915......	22	3,161	98	113,988	112,457	5,181	122,199	1,326,448	1,499,284
1916......	22	3,198	109	113,346	113,383	5,152	148,785	1,509,083	1,706,948
1917......	(f) 21	2,976	124	111,673	114,100	5,318	192,923	1,822,979	2,081,723

ASSETS (000 Omitted).

31 Dec.	Specie and Dominion notes			Securities	Loans and discounts	Total assets
	In banks	Gold reserve	Total			
1870........................	$14,018	....	$14,018	(d) $4,847	$78,064	$110,973
1880........................	16,485	....	16,485	(d) 2,687	124,869	192,537
1890........................	16,328	....	16,328	(d) 8,603	202,056	260,137
1900........................	31,558	....	31,558	50,248	362,043	501,542
1910........................	109,418	....	109,418	97,303	880,857	1,239,791
1911........................	135,121	....	135,121	94,906	983,444	1,390,069
1912........................	128,364	....	128,364	102,140	1,107,992	1,526,081
1913........................	150,201	$7,597	157,798	104,398	1,108,426	1,551,263
1914........................	200,610	9,700	210,310	105,661	1,046,522	1,555,557
1915........................	213,543	17,360	230,903	122,495	1,111,870	1,737,992
1916........................	195,922	43,700	239,622	262,777	1,188,978	1,948,044
1917........................	249,542	97,270	346,812	468,406	1,227,363	2,323,163

(a) Five other small banks not reporting.
(b) Eight other small banks not reporting.
(c) Two other small banks not reporting.
(d) Government securities only.
(e) Exact figures not available.
(f) Since this report was made, the number of banks has been reduced to 19; the Bank of British North America, which operated on an Imperial charter, was incorporated by the Bank of Montreal, and the Northern Crown Bank by the Royal Bank of Canada — both in the early part of 1918.

The dividends paid vary from 5 to 14 per cent, the average rate being 10.

The chief place of business of most of the banks is at either Montreal or Toronto, only three having their head offices west of Ontario. The right to establish branches is specifically granted, and most of them have numerous branches, several being represented in nearly every Canadian town of any importance. The Bank of Montreal, for instance, has about 174 branches in Canada and 10 elsewhere, the Canadian Bank of Commerce about 374 in Canada and 7 elsewhere, and the Royal Bank of Canada about 366 in Canada and 65 elsewhere. Several have branches or agencies in London and some of the more important cities in the United States, those represented in New

York being among the largest dealers in foreign exchange. Newfoundland is entirely dependent for its banking facilities upon the Canadian banks, which have some 28 branches there, while a large proportion of the whole banking business of the West Indies, including Cuba, Porto. Rico, British Guiana, etc., is done by two Canadian banks — the Royal Bank of Canada and the Bank of Nova Scotia,— which have between them about 70 branches in the West Indies and adjoining districts. The foregoing tables show that the 21 banks in existence at the end of 1917 had 3,100 branches, an average of 148 branches per bank. Each bank is administered by directors, not less than five in number, who are elected annually by the shareholders, each share carrying one vote. Directors must each hold paid up stock of from three to five thousand dollars, according to the total amount of the capital stock; the majority of them must be British subjects domiciled in Canada. A general meeting of shareholders must be held annually at which directors must submit a clear and full statement of the affairs of the bank. Statements of assets and liabilities (in a prescribed form) must be sent monthly to the Minister of Finance, by whom they are published in the *Canada Gazette*. Two or three other returns are also required, and the Minister of Finance has power to call for special information from any bank. The banks have long made a practice of having all their branches and departments inspected at least once a year by their own inspectors, but until 1913 no system prevailed either of audit by the shareholders or of examination by the government. In that year, in deference to popular sentiment, provision was made for an audit by a person or persons appointed by the shareholders of each bank in general meeting, such persons being selected each year from a list of persons (not less than 40 in number) chosen by ballot by the general managers of all the banks at a meeting called annually for that purpose, and approved by the Minister of Finance. Every such auditor has a right of access to the books and accounts, cash, securities and documents of the bank, and is entitled to require from the directors and officers such information and explanations as may be necessary for the performance of his duties. The auditor must certify to the correctness of the statement presented to the annual general meeting of shareholders, and of any other statement which the shareholders may by by-law require. Provision is made for special audits at the direction of the Minister of Finance. The practical working out of this audit system is still on trial, but it may be anticipated that at the next revision of the Bank Act the selection of the panel of auditors will be removed from the general managers, the persons against whom the audit is more particularly directed, that more practical opportunity for independent selection will be given to the shareholders, and that a restriction will be placed on the number of banks for which any one person (or members of the same firm) may act as auditor.

In the United States the bank's president is generally its chief executive officer, but in Canada this is not the case. British precedent is followed, and the bank is managed by a general manager, who accepts the fullest responsibility for the conduct of its business. The Board of Directors deliberate on all important transactions and all applications for large credits which have been approved by the general manager are submitted to them. The branch managers are responsible for the general business of their respective branches, and, as a rule, are allowed to use their own discretion in making advances up to certain amounts, varying according to the importance of the particular branch. Any loans applied for in excess of the limit fixed must be referred to the general management at the head office. By means of the branch system credit is distributed throughout the whole country; money borrowed from depositors in the rich but less progressive portions of Ontario may be lent out again in the newest parts of the Northwest, and interest tends toward a common level. The average rate obtained in western Canada is only about 1 per cent more than in Ontario. The banks being large, and under no restrictions as to the amount which they may lend to any one customer, are able to supply the total needs of any person with whom they are willing to do business. They grant yearly credits, and practically undertake to supply their customers' wants up to the limit fixed at any time during the continuance of the credit. As a corollary to this they almost invariably require that each customer shall borrow from only one bank.

No special percentage of cash reserves is required to be kept — in fact, the banks are not required by law to keep any cash or other reserves — but of whatever cash reserves are kept in Canada at least 40 per cent must be in Dominion notes. Percentages of cash reserves to total liabilities to the public held by all banks on 31 December in certain years were as follows:

(000 Omitted).

31 Dec.	Specie	Dominion notes	Total cash reserves	Total liabilities to public	Percentage cash to liabilities
1900...	$11,773	$19,785	$31,558	$392,150	8.4
1910...	33,411	76,007	109,418	1,036,075	10.5
1911...	37,464	97,657	135,121	1,174,323	11.5
1912...	33,780	94,584	128,364	1,292,451	9.9
1913...	46,620	111,178	157,798	1,308,757	12.0
1914...	67,070	143,240	210,310	1,314,646	15.9
1915...	74,205	156,698	230,903	1,499,284	15.4
1916...	83,132	156,490	239,622	1,706,948	14.0
1917...	101,712	245,099	346,812	2,081,733	16.6

It must not be forgotten that the banks' cash reserves are only their first line of defense. Their real reserves are in the shape of call loans in New York against stocks and bonds, balances in the hands of their correspondents and securities lodged with their agents in London and elsewhere, against which they are entitled to draw at any moment. New York and London are the final settlement points, and it is there that real strength is most necessary and most effective.

On 31 Dec. 1917 there were 25 clearing-houses in Canada, the oldest being that at Halifax, which was established on 1 July 1886. Montreal followed in January 1889 and Toronto in July 1891. The others, listed in order of age, are Hamilton, Winnipeg, Saint John, Vancouver, Victoria, Quebec, Ottawa, London, Calgary, Edmonton, Regina, Brandon, Lethbridge, Saskatoon, Brantford, Moose Jaw, New Westminster, Medicine Hat, Peterboro, Fort William, Kitchener and Sherbrooke.

The total clearings in certain years have been: 1900, $1,584,869,240; 1910, $6,115,039,241; 1911, $7,343,729,546; 1912, $9,147,334,855; 1913, $9,230,096,680; 1914, $8,063,814,799; 1915, $7,276,476,210; 1916, $10,557,187,917; 1917, $12,552,821,949.

The right to issue notes intended for circulation (other than notes issued by the Dominion government, see CURRENCY, COINAGE AND LEGAL TENDER) is confined to the chartered banks. The bank may issue and reissue notes of $5 and multiples thereof, which must circulate at par in any and every part of Canada and must be redeemed on demand in specie or Dominion notes. In order to ensure this the bank must establish agencies for the redemption and payment of its notes at Toronto, Montreal, Halifax, Saint John, Winnipeg, Victoria, Charlottetown, Regina and Calgary, and at such other places as are, from time to time, designated by the Treasury Board. In addition, the bank must accept its own notes in payment at any of its branches. The notes issued by a bank are a first charge upon all its assets, and they are also especially secured by the Central Gold Reserve and by the "Bank Circulation Redemption Fund," to which all the banks have contributed 5 per cent on their average circulation and which is held by the government for the purpose of redeeming with interest at 5 per cent any notes of a suspended bank which the bank or its liquidator is not ready to redeem within two months after the date of suspension. The result of this is that the other banks readily accept at par the notes of a suspended bank, the notes remaining in their hands earning interest at 5 per cent until they are redeemed. As the banks are obliged to replenish the Redemption Fund gradually if it ever becomes depleted, they are all practically guaranteeing the notes of each. The amount at credit of this fund on 31 Dec. 1917 was $5,769,631, bearing interest at 3 per cent. No call has yet been made on it. Since 1841 the limit of the bank's authorized note issue had been the amount of its unimpaired paid-up capital, and for many years the banks had found no difficulty in keeping well below this limit. So late as 31 Dec. 1890 the total paid-up capital of all the banks was $60,000,000, while their note issue was only $35,000,000. But early in the present century conditions began to change, and by 1907 the increase in capital had so far failed to keep pace with increase in business that on 31 October of that year the total note issue had reached its legal maximum, unless and until some of the banks increased their capital. But as the acute need for the issue of additional notes only existed during four or five months each year, the banks were loath to increase, for this purpose alone, capital which was otherwise sufficient, so in 1908 each bank was authorized to issue "during the season for moving the crops," that is, from 1 October to 31 January, "excess circulation" to the extent of 15 per cent of its combined unimpaired paid-up capital and rest. In 1912 this period was extended to run from 1 September to the end of February. On this "crop-moving" issue the bank must pay to the government interest at a rate to be fixed by the government, but not exceeding 5 per cent per annum. In 1913 provision was made for "central gold reserves." Trustees are appointed by the Canadian Bankers' Association and by the Minister of Finance, who receive such amounts in current gold coin and Dominion notes, or either, as any bank may desire from time to time to deposit. Against the gold and notes thus actually held for it, any bank may at any time issue notes of an equal amount, in addition to the amount which it may otherwise issue. The "excess circulation" provision was also continued. Although this arrangement makes it easy for the banks to furnish all the currency needed, it may be doubted whether, from the public standpoint, it is altogether wise. The "gold reserve" feature is illogical, inasmuch as assets which already form part of the general security for the total note issue are placed in the hands of trustees, and there used as special security for an additional issue. All that is gained is the physical certainty of their actual and continued existence, and possibly some small increase in total cash reserves. But as the security is ample in any event, this is of little consequence. A serious objection is that the banks are thereby relieved to a considerable extent from the necessity of increasing their capital from time to time as their business increases, and thus the "margin of safety," in the form of capital and double liability, which is the general creditors' insurance against loss, tends constantly to become proportionately less at a more rapid rate than it otherwise would. And in this way, too, any tendency to undue concentration in banking is strengthened.

Very heavy fines are imposed in the case of over-issue, these fines varying from the amount of the excess circulation, if the excess is not over $1,000, up to $100,000, if the excess is over $200,000.

The security behind the total bank issue is shown by the following figures:

Total note issue 31 Dec. 1917 (of this $24,078,909 held by banks)	$192,923,824
Specie held:	
By banks (about 90 per cent gold)	$82,032,863
In central gold reserve (gold)	19,680,000
Dominion notes held by banks	245,099,000
(Gold held against notes by government, say $103,000,000)	
Circulation Redemption Fund	5,769,631
Dominion and provincial government securities	188,703,175
	$541,284,669
Other assets	1,781,879,114
Total assets	$2,323,163,783
Double liability of shareholders	106,807,110
Unpaid stock	417,690
Total security	$2,430,388,583

The bank's unissued notes cost it nothing, except for paper, printing and transmission, and it is thus enabled to keep at each of its branches a sufficient supply of currency for ordinary requirements, without any loss of interest except on a trifling amount of change-making currency. This has an important bearing upon the cost of establishing and conducting small branches. As the note issue is a source of profit, each bank pays out within its limit only its own notes and sends in for redemption the notes of other banks which it receives. Daily exchanges are made at every point where two or more banks are represented, each bank sending in to the other all the notes issued by the other bank which it received the previous day. The resulting balances are settled at the smaller places by drafts on the Clearing-House centres. In this way an automatically elastic currency is obtained, and the banks are enabled, up to the extreme limit of their issuing power, to meet the annual demand for currency to "move the crops" — a demand which in an agricultural country like Canada is very urgent — while at the same time the daily redemption provides that the extra supply of notes will be forced out of circulation as soon as the need of them has passed. The elasticity of the note issue is shown by the following table:

TOTAL NOTE ISSUE OF THE CHARTERED BANKS.

(000 omitted)

YEAR	Lowest point reached		Highest point reached		Percentage of increase
	Amount	Date	Amount	Date	
1900...	$41,320	January	$53,198	October	28.75
1910...	73,379	"	95,992	"	30.8
1911...	77,111	"	105,855	"	37.2
1912...	88,065	"	115,473	November	31.1
1913...	94,576	"	119,497	"	26.3
1914...	93,064	April	123,745	October	32.9
1915...	96,288	"	124,154	November	29.9
1916...	111,029	January	148,785	December	34.0
1917...	133,358	"	196,135	November	47.0

In the course of each bank's daily business, it receives notes issued by other banks, which are not sent in for redemption until the following day, at the earliest — sometimes not for two or three days. A certain proportion, therefore, of the total note issue is always in the hands of the banks themselves, and of total notes in circulation on 31 Dec. 1917, of $192,923,824, the amount thus held was $24,078,909, or about 12.5 per cent of the total outstanding, leaving $168,844,917, or about 87.5 per cent actually in the hands of the public.

The Canadian Bankers' Association is by statute charged with the duty of supervising and controlling all details connected with the issue of notes. The merits of the Canadian bank note may be thus summed up: First, it is safe; nothing but national insolvency could make its ultimate redemption doubtful. Second, it is redeemable on demand in specie or Dominion notes; if suspension of payment occurs, the note bears interest at 5 per cent until it is redeemed, and if not redeemed by the bank within two months, it will be paid out of the Redemption Fund. Third, it passes at par from one end of Canada to the other. Fourth, the amount in circulation always tends to be the exact amount demanded by the industrial activity of the country. The bank is obliged to confine its business within the limits which are almost universally assigned to the banker. Speaking generally, it may not deal in merchandise, or be engaged in any trade; it may not lend money upon the security of goods, or ships, or lands, and other immovable property, nor may it advance against its own stock, or the stock of any other bank, but it may lend against or take as security bonds of an incorporated company, even though the bonds are secured by mortgage on real estate. It may, however, under certain conditions, lend money to wholesale manufacturers, and to wholesale purchasers, shippers of or dealers in various products, on the security of the goods they manufacture or deal in, and it may lend to any person on the security of a bill of lading or of a warehouse receipt. It may also lend money on the security of standing timber, and may make advances for shipbuilding, taking security on the ship. As additional collateral to a debt already contracted it may take security of almost any kind, except goods or documents representing goods, and it has a first lien on its own stock for any liability due to it by a stockholder. It cannot recover by process of law any interest in excess of 7 per cent, but no penalties for usury now exist.

In addition to carrying on the ordinary business of a commercial bank, the Canadian banks receive money on deposit at interest, the prevailing rate at present being 3 per cent. Probably about 60 per cent of their total deposits would in the United States be deposits in savings banks. No securities are specially set aside against any deposits. Deposits due to the Dominion government are a second charge on all the assets of the bank (the notes being the first), and those to any provincial government are a third charge. One bank may sell out all its assets to another bank, proper provision being made for the assumption of the liabilities of the selling bank. The purchase price may be in stock of the purchasing bank, or in such other form as may be arranged. No agreement to sell, however, may be made unless and until the Minister of Finance, in writing, gives his consent. In at least one recent instance the Minister has, on grounds of public policy, withheld his consent. In the event of a bank suspending payment, it is taken in charge by a curator appointed by the Canadian Bankers' Association, who controls and supervises it until it either resumes payment or goes into liquidation. Suspension for 90 days, consecutively or at intervals within 12 consecutive months, constitutes the bank insolvent. If it becomes insolvent the shareholders are each individually liable for an amount equal to the amount of their respective holdings of subscribed stock in addition to any amount not paid up on such stock. This double liability did not exist in the case of the Bank of British North America (now incorporated in the Bank of Montreal), and its ordinary note issue was therefore confined to 75 per cent of its paid-up capital. Against any portion of the other 25 per cent which it might desire to issue, it had to make a special deposit with the government.

The giving of a fraudulent preference to any creditor, the corrupt acceptance of a gift, commission or other consideration in respect of dealing with the bank's affairs, or the making of false returns, etc., on the part of any director or officer of a bank, is punishable by heavy fines or by terms of imprisonment, or both. Since Confederation 25 banks working under Federal laws have gone into liquidation, their paid-up capital at the time of suspension aggregating some $17,000,000, and their total liabilities about $62,500,000. At least 14 of these paid noteholders and depositors in full, and all those chartered since Confederation paid their noteholders in full. Three, which failed before notes were made a first charge on assets, paid neither in full, but varying percentages to depositors, while one of these was a fraudulent affair, which was only in operation for a few months.

Savings banks under the management of the government are of two kinds: Government savings banks, under the control of the Finance Department, and post office savings banks, which are part of the post office system. The former were in existence in the Maritime Provinces for several years previous to 1867 and were taken over by the Federal government when the provinces entered into Confederation. In British Columbia savings banks controlled by trustees existed before Confederation, and these banks were wound up and «government savings banks» established in their stead. A government savings bank was opened in Winnipeg in 1871 and another in Toronto in 1872. In 1888 there were 50 offices with 57,367 depositors, having $20,682,025 to their credit, an average of $360 for each depositor. It has now been recognized that these banks are no longer necessary, and whenever the position of superintendent of any office becomes vacant, the deposits in that office are transferred to the post office savings bank.

By 31 Dec. 1917 the number of offices open had decreased to 14, all of them, except those at Winnipeg and Victoria, being in the Maritime Provinces. The total amount on deposit was $13,610,069. In 1868 the system of post office savings banks which had proved so successful in Great Britain was introduced into Canada, 81 offices being opened on 1 April in that year. On 31 Dec. 1916, there were 1,269 savings bank offices in Canada with 134,345 depositors and total balances of $40,478,123. In order to give some support to the theory that both kinds of public savings banks are intended primarily as safe places of deposit for persons of limited means, the net amount which may be received from any person during one year is $1,000, while the total amount which any depositor may have at his credit is $3,000. The rate of interest paid in both classes of savings banks was formerly 4 per cent but on 1 Oct. 1899 it was reduced to 3½ per cent and on 1 July 1897 to 3 per cent. Until recently there was, however, no justification for even 3 per cent being paid. Canada in normal times was able to negotiate term loans (against which no reserves need be kept) at a net interest rate of about 2.86. By an act passed in 1903 the Department of Finance is obliged to hold as reserves against savings bank deposits an amount in gold, or in gold and Canada securities guaranteed by the government of the United Kingdom, equal to not less than 10 per cent of the deposits. When to the rate actually paid on these deposits is added cost of reserves and expense of management (from one-fourth to one-half of 1 per cent per annum), the money held on deposit actually costs the country about 3.75 per cent. This fact was fully recognized by the government, and some years ago they proposed to reduce the rate paid to 2½ per cent, but, for political reasons, the proposal was withdrawn. Having regard to the high rates at which the government at present has to borrow for war purposes, it is a question whether the rate should not be raised to — say — 4 per cent.

Amounts held on deposit by the government in certain years were as follows:

YEAR	Government savings bank	Post office savings bank	Total
30			
1870 June........	$1,822,570	$1,588,849	$3,411,419
1880 "	7,107,287	3,945,669	11,052,956
1890 "	19,021,812	21,990,653	41,012,458
1900 "	15,642,267	37,507,456	53,149,762
31			
1908 March......	15,016,871	47,564,284	*62,581,155
1913 "	14,311,542	42,728,941	57,140,483
1914 "	13,976,317	41,591,286	55,567,603
1915 "	14,006,312	39,995,406	54,001,718
1916 "	13,480,348	38,404,932	51,885,280
1917 "	13,340,181	41,171,660	54,511,841

* Highest point reached.

Apart from the public savings banks, the only savings banks of any importance are the Montreal City and District Savings Bank, of Montreal, and La Caisse d'Economie de Notre Dame de Quebec. The former has a paid-up capital of $1,000,000, and a reserve fund of $1,350,000; its deposits are about $31,000,000, it holds securities of about $19,000,000, and has loans against securities of over $8,000,000. The latter has a paid-up capital of $250,000, and a reserve fund of about $1,000,000; its deposits are about $10,000,000, it holds securities of about $8,000,000 and has loans of about $3,000,000 against securities. These banks may invest 80 per cent of their deposits in certain approved securities, including the stock of chartered banks, and may make advances against such securities. These are the only classes of investments which they may make. They are specially prohibited from lending on real estate, promissory notes or commercial paper. Unlike the ordinary chartered banks, they have not the right to issue notes for circulation.

At the outbreak of the European War it became necessary to take steps to conserve the financial resources of the country. On 3 Aug. 1914, an Order in Council was passed, giving authority as follows: (1) To the Minister of Finance, to issue Dominion notes to such an amount as might be necessary against such securities as might be deposited by the banks and approved by the Minister; (2) To the banks, to make payment in bank notes, instead of in gold or Dominion notes; (3) To the banks, to issue at any time excess circulation not to exceed 15 per cent of their respective combined unimpaired capitals and rests.

This Order in Council (together with one dated 10 Aug. 1914, suspending the redemption in specie of Dominion notes (see CANADA —

Currency, Coinage and Legal Tender), was confirmed by an act (5 George V Chap. 3) dated 22 Aug. 1914, which continued it in force until 15 Sept. 1914, and gave the governor-in-council statutory power "In case of war, invasion, riot or insurrection, real or apprehended, and in case of any real or apprehended financial crisis," to make effective proclamation provisions similar to those contained in the Orders in Council of 3d and 10th of August, the only change being that advances to the Quebec savings banks were also authorized. On 3 Sept. 1914, a proclamation was duly issued, revoking the Orders in Council, and putting into force the provisions of the act. These provisions will doubtless be retained for some time after the end of the war. The effect of them is that the banks can at any time obtain from the government advances (unlimited in amount, so far as the law is concerned) of Dominion notes against approved securities deposited (these securities being deemed to be the security required by the Dominion Note Act to be held against Dominion notes: i.e., gold), that they may make *all* payments in bank notes including the payments necessary to redeem their own notes, which they are thus by law relieved from redeeming, and they may during the whole year issue excess circulation to the extent of 15 per cent of their combined unimpaired capital and rest, instead of only during the period from the beginning of September to the end of February. The practical effect of these provisions is that no gold and only change-making quantities of Dominion notes are paid out over the counter, so that the obtaining of gold by the public for hoarding, export or any other purpose is absolutely prevented. In order, however, to retain the daily redemption of notes not needed by the public, and to prevent large quantities of notes of one bank being held by other banks, the Clearing-House rules provide that the daily settlements at the chief redemption points shall continue to be made in Dominion notes. The whole arrangement has worked remarkably well; even in the disturbed days at the beginning of the war, when all commercial and industrial interests were in a state of absolute uncertainty, and no one knew how things would go from day to day, there was not the slightest tendency toward a run on the banks, which continued to pay their depositors and to all outward appearance to transact internal business as usual.

F. G. Jemmett,
Colonial Bank, London; Formerly Secretary, The Canadian Bank of Commerce.

48. PUBLIC FINANCE, 1867-1917. Up to the time that the various provinces, which originally constituted the Dominion of Canada, entered into Confederation, they had depended almost entirely for their provincial revenues upon customs duties upon imports, supplemented by a limited set of excise taxes. Direct taxation upon property and income had been practically entirely reserved for the municipalities, both rural and urban. These municipal revenues, however, had been regularly supplemented from the provincial treasuries by grants in aid of specific requirements, chief of which were education and transportation, or schools and highways and bridges. The larger public works, such as railways and canals, harbors and roads, were for the most part undertaken by the provincial governments, or by corporations chartered by them and heavily subsidized or aided in other ways, including authorized municipal assistance.

Source of Revenue.— Such being the financial conditions of the provinces at the time of Confederation, one of the chief difficulties to be faced was that of persuading the individual provinces to resign almost their only methods of taxation, customs and excise, into the hands of the new Federal government, and thus be left to cast about for other and hitherto but little developed sources of revenue. After much discussion, but under the somewhat stimulating pressure of necessity, a compromise was arrived at. The new Dominion or Federal government was granted sole control of the customs, excise and all other so-called indirect methods of taxation; while the provinces and their subordinate municipal institutions were confined to direct methods of taxation without, however, excluding the Dominion government from these sources also. On the other hand, the Dominion, in view of these sacrifices on the part of the provinces, not only assumed the future costs, management and maintenance of all the larger and expensive public works and public services, but also assumed the previously accumulated funded debts of the provinces. In addition, the Dominion was required to grant to the respective provinces, on a specified basis, certain annual subsidies in cash. These for some time furnished the most important element in their respective provincial revenues. The amounts of these provincial subsidies have been the occasion of much agitation and not infrequent revision ever since. To the provinces were also assigned the various public lands, including the timber and mines on or within them. At the same time, the British North America Act authorized both the provincial and Dominion governments to borrow money on the basis of their respective public credits.

The very strong and long grounded dislike of the Canadian people, both French and English, to direct taxation led not only, as we have seen, to the confinement of this method of taxation to the self-imposed levies on the property owners of the municipalities, but steadily prevented, until quite recently and chiefly under the temporary requirements of the war, the levy of direct property and income taxes for provincial or Dominion purposes. Thus in most cases, up to the outbreak of the present great war, there had remained a sharp distinction between the sources of the revenues of the Dominion, provincial and municipal governments. This separation has been of the greatest value to the people of Canada in simplifying their fiscal problems, and in keeping before them the distinct fields of responsibility for the levying and expending of the various contributions which the citizens are called upon to make in support of the different public administrations under which they live.

As already indicated, the revenues of the Dominion are, for the most part, derived from customs duties on imports and excise duties on certain lines of manufactured goods, chiefly liquors and tobaccos. Owing to the customary method of presentation and discussion of the annual budgets and public accounts of the Dominion, the very limited source of the chief revenues of the country is apt to be overlooked. The present situation arose from historic conditions and the necessity for remedying certain obvious abuses under former methods of dealing with public accounts. Thus, at one time, the officials connected with the collection of the public revenue, whether levied as taxes or obtained in connection with certain public services, were permitted to retain, chiefly in the shape of fees and expenses, the cost of collection, returning to the government only the balance in its favor. When combined with the prevalent system of political patronage, the abuses connected with this method can be readily understood. In order, therefore, to bring as much as possible of the receipts and payments from the various departments to the attention of Parliament and the country, the ordinary receipts from the different sources, except from loans and trust funds which are otherwise accounted for, were combined in what is known as the consolidated fund. Out of this is paid both the ordinary and miscellaneous charges and expenses of the government, except what is applied in the way of capital expenditure or the redemption of debt, or special subsidies and grants. At the same time, in connection with some of the public service, as for instance the postal service, a very considerable element of the expense connected with it is deducted before the remaining funds are handed over to become part of the consolidated revenue. Thus the total gross revenue of the Post-Office Department amounted to upwards of $16,750,000 in 1914–15, but charges to the extent of almost $4,000,000 were deducted therefrom before the remaining amount of nearly $13,000,000 was handed over as part of the consolidated revenue.

For the fiscal year ending 31 March 1915, the consolidated fund amounted to $133,073,481 and the expenditures chargeable to it amounted to $135,523,206, representing a deficit of nearly two and a half millions, to be met from loans or other available resources not constituting part of the consolidated fund. When, however, we come to analyze the sources of revenue making up the $133,000,000 of the consolidated fund, and the items of expenditure which are charged upon it, we find that a large portion of the fund represents simply the gross income from various government services, such as the postal and government railway services; while the charges upon it include also the working expenses of these same enterprises, so far at least as they have not been already deducted before being brought into the budget, as indicated above in the case of the Post-Office Department. Thus, for instance, the consolidated fund includes receipts from the postal service of slightly over $13,000,000, but when we turn to the expenditures from the fund, we find that the operating expenses of the postal service amount to almost $16,000,000. This takes no account of the considerable portion of an expenditure of some two millions on mail subsidies and steamship subventions. Further the central or administrative staff of this service at Ottawa costs an additional $800,000, being included in the item of "civil government." If one cares to go further and turn to the detailed expenditures of the Public Works Department, it will be found that of the expenditure for the year of $7,750,000, a large section is represented by either new post-office buildings, separately, or combination public buildings, the chief sections of which are commonly devoted to the postal service. Thus instead of the Post-Office Department furnishing any real revenue to the government, it represents a very extensive additional charge upon the real revenues of the country. The same is true of the large revenue item of $12,000,000 from the government railways,— the Intercolonial, Prince Edward Island, Transcontinental and one or two small lines. We find on referring to the operating expenses of these lines that not only is this revenue entirely absorbed but there is left in its place some $325,000 of a deficit on operating expenses. This does not take into account the share of the Railway Department in the expenditure under civil government of $188,000 for the staff of the Department of Railways and Canals. Neither does it take into account the interest on the enormous capital expenditure on the government lines and which constitutes so large a part of the interest charge on the public debt, amounting to over $15,000,000.

It might appear that the sale of Dominion lands, amounting to over $2,800,000 in 1914, would furnish a very considerable surplus of revenue. But we find that the annual cost of the administration of the Dominion lands amounted to $3,700,000 in the same year. Another important item in the annual receipts included in the consolidated fund is that of $2,900,000 of interest on investments. But this, it is found, represents chiefly the interest on the advances to the Grand Trunk Pacific, amounting to over one and a half millions, on Montreal Harbor debentures, the sinking fund, advances to banks, etc. Altogether the interest on investments represents but a small offset on the interest requiring to be paid by the Dominion on the public debt, which, directly or indirectly, was partly incurred for these purposes.

Income from Taxation.— One of the tables in the Annual Report on Public Accounts, prepared by the Finance Department, sets forth separately the income from taxation, which is the real income of the country, and the income derived from other sources, largely, as indicated, the gross receipts from certain government services. Up to the outbreak of the European War, there were, as mentioned, only two real sources of revenue: customs and excise duties. The Chinese immigration tax, though listed separately, is really a customs tax on imports with the usual protective object in view. Since 1914, to these two sources of direct revenue the special war taxes, to be referred to, must be added.

Distinguishing taxes proper from the other sources of income, we find that of the total receipts of $133,073,481, constituting the consolidated fund for the year 1914–15, $97,715,440 were derived from taxes proper, while $35,358,041 were derived from the other sources. Of the charges which are almost entirely paid out of the $97,000,000 of taxation, the chief are the following:

Interest and management of the national debt.	$16,188,000
Customs and excise collection	4,605,000
Subsidies to the provinces	11,451,000
Sinking funds	1,645,000
Civil government	6,157,000
Administration of justice	1,469,000
Legislation	2,376,000
Arts, agriculture and statistics	3,618,000
Immigration	1,658,000
Militia (apart from the war)	10,000,000
Public works (not charged to capital)	19,343,000
Mail subsidies and steamship subventions	2,162,000
Ocean and river service	1,133,000
Lighthouse and coast service	2,583,000
Trade and commerce	2,943,000
Indians	2,400,000

These items account for somewhat over $89,500,000 of the regular revenue, leaving about $8,000,000 to meet other minor items of unremunerative expenditure and cover the deficits on the various remunerative government enterprises whose gross revenue furnishes the other $35,000,000 of income. This $35,000,000 of revenue partly meets what we have called the working expenses of the departments; the chief of these items are:

Post-office	$15,961,000
Public works, collection of revenue	799,000
Railways and canals	13,876,000
Dominion lands	3,701,000
Weights, measures, gas and electric light inspection, etc	288,000

These items alone amount to $34,500,000, leaving about $750,000 for all the other smaller items of this character. As a matter of fact, as already indicated, most of the deficits, representing the surplus of costs over revenue in these branches of the service, have to be met out of the additional $8,000,000 remaining from the tax revenue as indicated above.

Special Funds.— The Dominion government has the use of several trust funds, such as the post-office and savings bank deposits on which a comparatively low interest is paid. It enjoys also the issue of Dominion notes to a specified amount in excess of the specie reserve. The other funds, beyond the consolidated fund, which are available for expenditure within the year are, first, any surplus of revenue from the consolidated fund; second, loans, whether permanent or temporary, raised during the year. Under normal conditions these extra funds are applied to meet any deficit in the consolidated fund, for the redemption of debt, capital expenditure on public works, or subsidies to railroads, and other special grants.

As to what works may be chargeable to capital expenditure or to annual revenue out of the consolidated fund is largely a matter of expediency. In the history of the Dominion since Confederation, the views and the practices of finance ministers and governments have varied very considerably. Thus, items which at one time are regarded as properly charged to consolidated revenue are, at another, charged to capital account. Apparently the most influential element in determining the variations in practice has been the condition of the public purse, and the very natural disinclination of ministers of finance and their colleagues to present budgets showing deficits on the ordinary annual expenditure. The lack of any definite principle in the division between expenditure from consolidated revenue and expenditure on capital account will be recognized in a survey of the details of the items charged to capital account and annual revenue in the Departments of Public Works and Railways and Canals.

Changes Resulting from the War.— We turn now to take a brief survey of the financial changes which have resulted from the voluntary participation of Canada in the present great war. Canada has undertaken to bear the entire cost of placing half a million troops in the field, fully equipped, transporting them to and from Europe, maintaining them on the front with provisions, munitions, ambulance and hospital equipment and all the other expenses incidental to war. In so doing the country has necessarily to face new and hitherto untried problems of finance. The government has followed the British example of meeting as large a share as possible of the expense from increased taxation, and the remainder from loans. Both old and new forms of taxation have been employed in raising additional revenue. In 1914 additional customs duties were levied on a list of articles mostly of foreign production, and more or less in the line of what are now considered necessary luxuries, and therefore likely to increase revenue rather than curtail consumption. Excise duties on liquor and tobacco were also increased. The additional revenue expected from these sources was about $1,000,000 per month.

In 1915 the customs dues were still further augumented by a general increase of 5 per cent on the British preferential rates and of 7½ per cent on all other rates. This additional tax was applied, with a few specific exceptions, to goods both free and dutiable in the regular tariff. As a result, although the imports of the previously dutiable goods fell off in 1915–16 while the total imports increased only $32,500,000, yet the customs revenue increased $24,735,000 over the previous year.

The government issue of Dominion notes, supported by a 25 per cent reserve instead of 100 per cent reserve, was increased from $30,000,000 to $50,000,000, thereby securing an additional free loan of $15,000,000. So large, however, was the volume of notes fully secured by gold that this change reduced the reserve on the total issue merely from 81 to 71.7 per cent.

New features of Federal taxation were first introduced in 1915, and consisted of special taxes of 1 per cent on bank notes, 1 per cent on the interest income of loan and trust companies and the net premium of insurance companies, except life and marine. Telegraph and cable messages were taxed one cent each, and railway and steamship tickets at graduated rates. Other features were a two-cent stamp on bank cheques, bills of exchange, money and postal orders, travelers' cheques, and notes discounted at banks. There was also a levy of one cent extra on letters and post cards. Additional excise stamps of varying amounts were levied on proprietary medicines, perfumery and wines. During the first year the revenue from these special taxes amounted to somewhat over $3,000,000.

In 1914 the special appropriation for war purposes was $50,000,000, the following year $100,000,000, and for 1916–17 $250,000,000. In this connection two quite new departures in

Federal finance were made. During the summer of 1915, the first Dominion loans to be negotiated in the United States were arranged. The first was for $25,000,000 and the second for $20,000,000. These were followed in the spring of 1916 by another loan of $75,000,000, floated in New York. The other departure was the raising of a domestic loan for $50,000,000, in the autumn of 1915. This was so successful that over twice that amount was subscribed and $100,000,000 accepted. In the autumn of 1916, the experiment was repeated for another $100,000,000 with perfect success. Exchange conditions, owing to the enormous surplus of British imports from America during the earlier period of the war, rendered it undesirable to borrow in Britain for use in America. A mutual arrangement was therefore effected by which the British treasury advanced funds for Canadian war expenditure in Europe and the Canadian government, partly from its own borrowings and partly by credit arrangements with the banks, financed British purchases in Canada, thus naturally relieving the transatlantic exchange situation.

As the Canadian war expenditure increased, additional taxes were imposed. The new taxes of 1916 took the form of a levy on exceptional profits, most of which were naturally due to the production of army supplies. The tax consisted of one-fourth of all profits in excess of 7 per cent from incorporated companies, and in excess of 10 per cent in other cases. Naturally in the administration of such a tax a good deal of discretion had to be allowed to the officials of the Department of Finance.

One of the most interesting questions which arises in connection with the new departures now being made, both as to methods of taxation and sources of loans, is as to whether and how far these experimental ventures may permanently affect the future financial practice and policy of Canada.

Provincial Finance.— We may now take a brief survey of the leading features of Canadian provincial finance. As already indicated the provincial subsidies of the Dominion treasury constituted the original basis of provincial revenue. The Dominion having assumed, up to a certain specified amount, the debts of the four original provinces of Ontario, Quebec, Nova Scotia and New Brunswick, found it necessary to make corresponding allowances for the other provinces as they entered Confederation, or were created out of the vast western territories held by the Dominion government, on much the same basis as those territories out of which have been created the Western States of the American Union were held by the Federal government at Washington. In view of the reasons for granting them, these were known as "debt allowances," and interest is paid on them at special rates. The object of the debt allowance was, of course, to enable the new provinces to equip themselves with such provincial public works and buildings as would place them on a fairly equitable footing with the older provinces when they entered Confederation. In the case of the two last provinces to be created, Alberta and Saskatchewan, no definite debt allowances were fixed, but they were granted specific annual subsidies in lieu of the interest upon fixed capital sums.

The details of the frequent agitations for readjustment of the original financial arrangements with the provinces, either at the time of Confederation or on their subsequent entrance or creation, and the actual changes effected from time to time, are quite beyond the scope of this article. Suffice it to say that the grounds on which these relations at present stand, though still subject to demands for revision, are as follows:

1. A fixed grant according to population.
2. A per capita grant of 80 cents per head up to a population of 2,500,000, and at the rate of 60 cents per head above that number.
3. Special grants for buildings, in lieu of public lands.
4. Interest upon debt allowances, or annual grants in lieu thereof.

In raising the remainder of their revenues, the provinces, especially of recent years, have devised many new taxes. As in the case of the Dominion, however, their budgets combine purely revenue taxes and incomes from various forms of provincial service, and these incomes are either wholly or partially offset by the cost of rendering these services. For a considerable time, as already indicated, the taxes on real estate and provincial income were exclusively assigned to the municipalities for the support of their local requirements. Up to 1915 only two provinces had departed from this policy, British Columbia and Prince Edward Island. Both levy a tax upon real estate and income, while British Columbia alone has resorted to that old standby of the American States, the personal property tax.

It is impossible to go into details with reference to the very varied financial arrangements, and classifications of revenue and expenditure, of the different provinces. In their provincial accounts, the combinations of items in some provinces and the separation of them in others render it very difficult to make any detailed comparisons of their budgets. Certain broad facts, however, stand out as indicative at once of those features common to the majority of the nine provinces and those which are peculiar to individual provinces owing to their special historic or physical conditions, though sometimes due also to special lines of policy. Taking the last available returns for all the provinces up to 1914, we find that beyond the Dominion subsidies, the most common sources of provincial revenue are succession duties, taxes on corporations and various special fees. In these all the provinces share. In some cases the returns from certain fees and licenses are set forth separately. Thus licenses for the sale of liquor, for motor vehicles, moving pictures, hunting and fishing, etc., are listed separately in a number of accounts. Six provinces derive revenues from Crown lands, timber and mines, and from interest on investments. Most of them derive a certain revenue from hospitals and public charities which tends to offset the cost of these institutions. Revenues come also from certain public works, and from activities in aid of agriculture. Certain revenues, as regards their relative importance at least, are peculiar to individual provinces. Among these are the tax on fox farms in Prince Edward Island, royalties on coal mines in Nova Scotia and British Columbia and to a lesser degree in Alberta, also on other mines in Ontario, Quebec and British Columbia. The income from the Timiskaming and Northern Railway, and the investments of the Hydro-Electric Commission, are characteristic of Ontario. Revenues from provincial telegraph and telephone lines are important in Manitoba, and from Chinese restriction in British Columbia. On the side of expediture there is more uniformity. All of the provinces have large outlays for interest and sinking funds, the administration of justice, for legislation, the civil service, education, public charities, agriculture and public works. Five of them expend considerable sums on colonization and immigration, several on mines, lands and forests. Ontario spends much on its Hydro-Electric Commission; Manitoba on telegraphs and telephones and British Columbia on its fisheries.

In six of the provinces the Dominion subsidy constitutes the largest item in revenue. In Nova Scotia the first place is taken by mines; in Ontario, lands, forests and mines; while in British Columbia no less than five sources of revenue take precedence of the Dominion subsidy, in the following order, timber royalties and licenses, Chinese restriction, land sales, wild land taxes and registration fees. Of those in which the subsidy takes the first place, the land tax comes second in Prince Edward Island, territorial revenue in New Brunswick, succession duties in Quebec and land title fees in the three Prairie provinces of Manitoba, Saskatchewan and Alberta. In Manitoba, however, the gross revenue from the telegraph and telephone service, and in Alberta the special tax on railway bonds, exceeded these items in 1914, but these do not represent normal revenues available for general purposes.

In the line of expenditure, education ranks first in five provinces, second in two, third in one and fourth in another. Where education is not first, public works in one form or another take precedence. In Manitoba, however, the gross outlay on the telegraph and telephone service exceeded all other items. In British Columbia public works, divided into two branches of (a) railroads, bridges and wharves, and (b) other public works, occupy the first and second places, with the civil service third and education fourth. The following table gives the total revenue and expenditure and the amounts per capita for the different provinces for the fiscal year ending at various periods in 1914:

PROVINCE	Total revenue	Revenue per head	Total expenditure	Expenditure per head
Prince Edward Island........	$525,555	$5 61	$445,396	$4 75
Nova Scotia.....	1,885,458	3 75	2,098,893	4 18
New Brunswick..	1,505,229	4 25	1,493,774	4 22
Quebec..........	9,000,377	4 25	8,624,368	4 07
Ontario..........	11,121,382	4 23	11,819,311	4 49
Manitoba.......	5,512,163	10 28	5,638,658	10 52
Saskatchewan...	5,866,220	8 12	5,396,380	7 47
Alberta..........	4,522,513	9 27	4,409,795	9 04
British Columbia.	10,479,259	21 46	15,766,912	32 30

The budgets of the provinces have not been materially affected by the war and yet it has had its influence in various ways. When the war broke out, largely as an expression of their enthusiastic support of the action taken by Great Britain, each of the provinces made typical contributions of supplies for the British army. Ontario and Manitoba contributed flour; Quebec, cheese; New Brunswich, potatoes; Alberta and Prince Edward Island, oats; Saskatchewan, horses and British Columbia canned salmon. These contributions amounted to nearly $2,250,000. Another large factor has been the provincial contributions toward the patriotic fund, to provide supplementary assistance for the wives, children and other dependents of the Canadian soldiers. To meet these and any other miscellaneous outlays connected with the war has already entailed the levying of additional taxation in most of the provinces.

Adam Shortt,
Commissioner of the Dominion Civil Service.

49. CURRENCY, COINAGE AND LEGAL TENDER. Interesting as it would be to trace the history of the currency and coinage of the various British provinces from the time when grain and furs were the actual currency, down through the card money of de Meulles, the *ordonnances* of Bigot and the Army Bills of 1812 to the present satisfactory system, such a task is quite impossible within the limits set for this article. "Broadly speaking," says Chalmers, "the currency history of Canada consists in the transition from the French *écu* to the silver Spanish dollar, and from the Spanish dollar to the gold dollar of the United States. But this transition has reference exclusively to the standard coin; the characteristic feature of Canadian currency, both in the 17th century and at the present day, is paper." During the French régime a special colonial coinage was struck in France, but until the period when the chartered banks began to provide a stable medium of exchange, we find a large proportion of the currency consisting of the gold and silver coins of various countries, passing current and made legal tender at rates which were changed from time to time in the hope of keeping coin within the country. British, French, Spanish, Portuguese, German, Mexican and American coins were all legal tender, while for the first 50 or 60 years after the British conquest the actual currency of old Canada consisted chiefly of Spanish silver and some British gold, together with paper, more or less doubtful in value, issued by merchants, private bankers and others.

By ordinance of 1777, followed up by acts of the legislatures of Upper and Lower Canada in 1796, the Halifax currency, with the Spanish dollar valued at five shillings, or four to the pound currency, was made the standard of the country, and new rates were established at which different coins should pass current. The British guinea, which appears to have been the gold coin most in use, was worth £1 3s 4d currency. The Halifax currency, it will be observed, was to sterling money in the proportion of 10 to 9, £10 currency being the equivalent of £9 sterling. In Lower Canada, however, accounts were for many years afterward kept in livres and sols, six livres being equal to one Spanish dollar, while in Upper Canada the York (or New York) currency was more or less in use, its basis being the Mexican *real*, known in North America as the York shilling, eight of which went to the dollar. Its use, however, was prohibited after 1 July 1822. With many attempts at change, and with variations in the ratings of different coins from time to time, the Halifax currency, which, it must be remembered, was a money of account only, remained as the legal currency system until 1853, when, after previous consultation with New Brunswick and Nova Scotia, a decimal system having as its unit a dollar equal in value to the American dollar was introduced and placed on an equal footing with the Halifax currency, and the British sovereign was made full legal tender at $4.8667. On 1 Jan. 1858, the decimal system was finally adopted as that in which all public accounts should be kept, and since that date Canadian currency has been on a gold monometallic basis, with a unit of value equal to the gold dollar of the United States.

On 1 July 1867, the Dominion of Canada came into being, uniting in one Confederation the provinces of Ontario, Quebec, Nova Scotia and New Brunswick; currency, coinage and legal tender were thereafter under the sole control of the Dominion Parliament.

The first Federal Act dealing with the standard of value and the metallic currency was passed in 1868. It declared that it was desirable that the currency of Canada should be assimilated to the basis agreed on at the monetary conference held in Paris earlier in the year, and also that it should be of the same value as the metallic currency of the United States. It provided, however, for the continued use of the old "pound currency" when this was desired. This Act was repealed by the Act of 1871, which established the metallic currency on its present basis throughout the whole of the Dominion except Prince Edward Island (entered Confederation, 1873) and British Columbia (entered Confederation, 1871) extension to these provinces being effected in 1881. In 1886 a consolidating act was passed, providing that:

> "The denominations of money in the currency of Canada shall be dollars, cents and mills — the cent being one hundredth part of a dollar, and the mill one-tenth part of a cent.
>
> "The currency of Canada shall be such, that the British sovereign of the weight and fineness now prescribed by the laws of the United Kingdom, shall be equal to and shall pass current for four dollars eighty-six cents and two-thirds of a cent of the currency of Canada, and the half sovereign of proportionate weight and the fineness, for one-half the said sum.
>
> "Any gold coins which Her Majesty causes to be struck for circulation in Canada, of the standard of fineness prescribed by law for the gold coins of the United Kingdom, and bearing the same proportion in weight to that of the British sovereign, which five dollars bear to four dollars eighty-six cents and two-thirds of a cent, shall pass current and be a legal tender in Canada for five dollars; and any multiples of divisions of such coin, which Her Majesty causes to be struck for like purposes, shall pass current and be a legal tender in Canada at rates proportionate to their intrinsic value respectively."

It will be observed that although the Canadian currency has a unit of value equivalent to that of the United States, the standard of value is the British sovereign.

Power was taken to make any foreign gold coins legal tender in Canada, and the American gold eagle of the weight and standard of fineness then existing, together with its multiples and halves, was made legal tender, each coin at its face value.

In 1910 the Act now in force (9–10 Edward VII, Chap. 14) was enacted. Its reads in part as follows:

> "The denomination of money in the currency of Canada shall be dollars, cents and mills,— the cents being one-hundredth part of a dollar, and the mill one-tenth part of a cent.
>
> "The standard for gold coins of the currency of Canada shall be such that of one thousand parts by weight, nine hundred shall be of fine gold and one hundred of alloy; and the standard for silver coins of such currency shall be such that of one thousand parts by weight nine hundred and twenty-five shall be of fine silver and seventy-five of alloy.
>
> "Gold, silver and bronze coins, struck by the authority of the Crown for circulation in Canada, of the respective denominations mentioned in the schedule to this act, and of the standard weight and fineness therein set out, shall be equal to and pass current for the respective sums in the currency of Canada following, to wit: for twenty dollars, ten dollars, five dollars, two and one-half dollars, fifty cents, twenty-five cents, ten cents, five cents and one cent."

SCHEDULE

Denomination of Coin	Standard weight *Grains*	Least current weight *Grains*	Standard fineness	Remedy allowance	
				Weight per piece *Grains*	Millesimal fineness
Gold					
Twenty dollar	516	513.42	Nine-tenths fine gold, one-tenth alloy; or millesimal fineness, 900	.50	1
Ten dollar	258	256.71		.40	1
Five dollar	129	128.355		.25	1
Two and one-half dollar	64.5	64.178		.20	1
Silver					
One dollar	360	....	Thirty-seven-fortieths fine silver three-fortieths alloy or millesimal fineness, 925	1.50	4
Fifty cent	180	....		1.00	4
Twenty-five cent	90	....		.60	4
Ten cent	36	....		*2.50	4
Five cent	18	....		†3.00	4
Bronze					
Cent	87.5	....	Mixed metal, copper, tin and zinc	‡140.00	....

* This remedy is on a group of one dollar's worth, ten pieces.
† This remedy is on a group of one dollar's worth, twenty pieces.
‡ This remedy is on a group of eighty pieces weighed against a weight of one pound avoirdupois.

It also provides that the British sovereign and multiples and divisions thereof, and the five, ten and twenty dollar gold coins of the United States shall pass current and be legal tender, and gives the governor in council authority to fix, by proclamation, the rates at which any foreign gold coins shall pass current and be a legal tender.

The actual currency of the country consists almost entirely of paper (see CANADA — BANKING SYSTEM) and this has been found entirely satisfactory. Until recent years there had been no Canadian gold coinage, while the silver and bronze coinage needed had been obtained from England, through the Royal Mint, an arrangement which had always worked very well. Influenced, however, by the large production of gold in the Yukon territory the government took authority, during the session of 1901, with the concurrence of the Imperial government, to establish at Ottawa a branch of the Royal Mint, which came into operation in 1908.

Since that date all Canadian coinage has been minted in Ottawa. In 1912 the Ottawa Mint began the coinage of Canadian five dollar and ten dollar gold pieces, and up to 31 Dec.

1915 $4,868,420 had been coined and issued. Practically none of this is in the hands of the public, which does not want and will not use gold, except very occasionally for some special purpose, and almost the whole of Canada's gold currency is held by the government or the banks, forming a small part of the country's gold reserves. These reserves are drawn upon or added to in the settlement of international balances, and for this purpose British and American gold is better adapted than is Canadian.

The subsidiary or token coins in use are five, ten, twenty-five and fifty cent pieces, all silver, and one cent, bronze. The total amount of silver coined and put into circulation in Canada (including $95,000 old coinage of New Brunswick) up to 31 Dec. 1915 is $19,848,323 and of bronze $1,212,933. Silver of the face value of $1,259,750 has been withdrawn for recoinage, and it is estimated that the amount now in circulation is from one-third to one-half of the total coined.

The history of the paper obligations of the Dominion government really begins before Confederation, when in 1866 the legislature of the province of Canada sanctioned an issue of provincial notes to an amount not exceeding $8,000,000. At Confederation this issue, amounting to $3,113,700, together with $605,859.12 issued by Nova Scotia, was assumed by the Dominion, and the «Dominion Notes» system was thus inaugurated. In 1868 provision was made for securing by specie the note issue up to $5,000,000 and 25 per cent of any excess, the balance up to the limit of $8,000,000 to be covered by provincial or Dominion debentures. In 1870 the issue limit was raised to $9,000,000, secured by 20 per cent of specie and 80 per cent of debentures, with authority to increase to any amount, providing the excess above $9,000,000 was covered by specie. In 1872 it was provided that only 35 per cent of this excess need to be so covered, while in 1875 it was enacted that for any issue between $9,000,000 and $12,000,000 specie to the extent of 50 per cent must be held, any excess above $12,000,000 being entirely covered by specie. In 1880 the issue was raised to $20,000,000 to be covered to the extent of at least 15 per cent by gold, an additional 10 per cent by gold or Dominion securities guaranteed by the Imperial government and the remaining 75 per cent by ordinary Dominion securities. The issue might exceed $20,000,000 to any extent provided the whole of any excess was covered by gold. In 1903 an issue of $30,000,000 was authorized, secured as to not less than 15 per cent by gold, and another 10 per cent by gold or guaranteed debentures. Any notes issued in excess of $30,000,000 were to be secured by gold.

Immediately after the outbreak of war in 1914 the Act (5 George V, Chap. 4) now in force was passed, its main provisions being as follows:

> "Dominion notes may be issued and outstanding at any time to any amount, and such notes shall be a legal tender in every part of Canada except at the offices at which they are redeemable".
>
> "Dominion notes shall be of such denominational values as the Governor in Council determines, and shall be in such form, and signed by such persons, two in number, as the Minister directs".
>
> "Dominion notes shall be redeemable in gold on presentation at branch offices established, or at banks with which arrangements are made for the redemption thereof as hereinafter provided".
>
> "The Minister of Finance shall always hold as security for the redemption of Dominion notes up to and including fifty million dollars, issued and outstanding at any one time, an amount equal to not less than twenty-five per centum of the amount of such notes in gold"
>
> "As security for the redemption of Dominion notes issued in excess of fifty million dollars, the Minister shall hold an amount in gold equal to such excess".
>
> "The Governor in Council may establish branch offices of the Department of Finance at Toronto, Montreal, Halifax, Saint John, Winnipeg, Victoria, Charlottetown, Regina and Calgary, for the redemption of Dominion notes, or may make arrangements with a chartered bank at any of the said places for the redemption thereof".

Under the authority of this Act the following notes were outstanding on 31 March 1917:

Provincial notes	$27,769.25
Fractionals	1,085,481.54
$1, $2 and $4	24,085,893.50
$5	3,253,092.50
$50 and $100	11,750.00
$500 and $1,000	6,526,500.00
	$34,990,486.79
$500, $1,000, $5,000 (for use of banks only)	148,258,500.00
Total	$183,248,986.79

A very large proportion of the large notes in circulation is held by the chartered banks for reserve purposes, and also as a medium in which to make their daily settlements with each other. A special form of note has therefore been issued, negotiable only between banks, and of no value except to a bank. This materially lessens the risk of loss by robbery when large amounts are being carried from one bank to another, or at any other time. Of the notes in circulation as above $148,258,500 were the special notes for the banks, while of the total issue of $183,248,986 the banks held $160,291,577, leaving only $22,957,409 in the hands of the public.

To comply with the provisions of the Act, the Minister of Finance should have held on 31 March 1917, as security for the note issue, gold or securities deposited by the banks under 5 Geo. V, Sec. 4, Subsec. 2 (see CANADA — BANKING SYSTEM) as follows:

Up to and including $50,000,000, 25 per cent.	$12,500,000
$50,000,000 to $183,248,986, dollar for dollar.	133,248,986
Legal requirements	$145,748,986

Of this total $113,110,154 was in gold.

Immediately following the outbreak of the European War, redemption in specie of Dominion notes was suspended, the necessary instructions being given by the Minister of Finance on 4 Aug. 1914. These instructions were approved by an order in council dated 10 August and given full legal confirmation by an Act (5 Geo. V, Chap. 3) passed on 22 August. Under the authority of this Act, the redemption in specie of Dominion notes is still (31 Dec. 1917) suspended, and the suspension will doubtless continue until the end of the war.

In recent years the following amounts of Dominion notes (including a petty amount of old provincial notes) were outstanding:

1900	30	June	$26,134,348
1910	31	March	87,173,342
1911		"	90,033,509
1912		"	113,368,858
1913		"	112,141,106
1914		"	117,834,859
1915		"	157,095,339
1916		"	176,969,293
1917		"	183,248,986

Legal tender in Canada is:

(1) Full legal tender. (a) Any Canadian gold coins struck under the authority of the Currency Act of 1910. (b) The British sovereign, and any divisions or multiples thereof, at $4.86⅔ to the £. (c) Gold coins of the United States of five, ten and twenty dollars each, at their face value. (d) Notes of the Dominion government, redeemable in specie on presentation (redemption suspended since 4 Aug. 1914).

(2) Limited legal tender. (a) Silver coinage of Canada up to $10. (b) Bronze coinage of Canada, up to 25 cents.

(3) Potential legal tender. Any foreign gold coin, at rates to be fixed by proclamation.

F. C. JEMMETT,
Colonial Bank, London; Formerly Secretary The Canadian Bank of Commerce.

50. THE GRANGER MOVEMENT. The Granger movement in Canada closely resembles in its economic and social features the movement of the same name in the United States from which it derived its initial inspiration. The Grange was first established in the province of Quebec in 1872 by Eben Thompson, a deputy from the United States. Two years later representatives from several Canadian Granges met at London, Ontario, and organized the Dominion Grange of the Patrons of Husbandry. In the declaration of principles then adopted the motto, «Unity, Liberty and Charity,» was heartily endorsed. The objects of the organization were declared to be to develop a higher and better manhood and womanhood among the agricultural class; to enhance the comforts and attractions of their homes; to encourage farmers to buy less and produce more; to diversify their crops; to condense the weight of exports, selling more on hoof and in fleece, and less in the bushel. The society expressed itself as opposed to the credit system, and the mortgage system. It declared itself to be independent of political organizations and disassociated from political parties. At the same time it was «reserved for every patron as his right as a freeman to affiliate with any party that will best carry out his principles.» The declaration of principles laid stress upon the importance of the abilities and sphere of women, who were admitted both to membership and to office in the order. The growth of the Grange during the next few years was very rapid. With the Dominion grange as its centre, it was organized in provincial granges, division granges and subordinate granges. In 1876 the secretary reported a total membership of 17,500 patrons, with 33 division and 530 subordinate granges. Of the latter 4 were in Nova Scotia, 7 in New Brunswick, 16 in Quebec and 503 in Ontario. There were also six subordinate granges in Quebec, organized under the National Grange of the United States. In the following year the Grange was incorporated by the Dominion Parliament, and in 1879 its membership reached 31,000. The Grange not only sought to exert an educative influence on the farming population by the distribution of literature, etc., but also set on foot, directly or indirectly, various economic enterprises of a co-operative nature intended to enable the farmers to buy and sell more cheaply by acting in union. Of these the most important was the Grange Wholesale Supply Company of Toronto, with a branch establishment at Halifax. This was a joint stock company whose capital was supplied by members of the society, and which sold farmers' supplies, seeds and minor machinery to the patrons at greatly reduced prices. The local distribution was effected by the members of the subordinate granges. The company issued for some years a paper devoted to the interests of the patrons under the title of the *Grange Bulletin*. In this were printed extensive price lists of farmers' supplies offered for sale. A similar undertaking was established in the form of the People's Salt Company of Kincardine. The economic enterprises of the Grange have not, however, met with marked success. The demands made upon the initiative of the co-operative purchasers have proved too exacting. After some 10 years of successful existence the enthusiasm which the institution of the Grange had at first aroused began to cool, and many of the subordinate granges died of inanition. In the year 1876, 271 new granges had been reported in Ontario alone; in 1891 only two subordinate granges were organized in Canada, and in 1898 no new organizations were reported. Meantime the constant lapse of those in existence, through the apathy of their previous supporters, greatly reduced the numbers of the active patrons. The total number of granges instituted had reached about 1,000, but at the 29th annual meeting (2 and 3 Feb. 1904) the secretary's statement shows that only 13 division granges and 30 subordinate granges (with a membership of 411) had reported during the last year. The receipts of the treasury of the Dominion grange, which amounted to $6,900 in 1876, fell to $134 in 1906. In that year the Grange was amalgamated with the Farmers' Association, a society reformed from the Patrons of Industry, but since 1909 no statistics of membership and no annual reports of this body have been issued. During the whole history of the order there were organized at one time or another 57 division granges, 976 subordinate, 2 provincial (Ontario and Maritime provinces), and one Dominion, making a grand total of 1,036 separate Grange organizations in the Dominion. Many persons had been led to join in the movement from the sanguine hopes of profit to be derived from the co-operative side of the enterprise, and fell away when these were not realized. On the whole, the Grange movement must be regarded as a failure in the direction of its economic enterprises, but its influence for the social and educational advancement of the farming class has undoubtedly been great. During the flourishing period of the movement literary exercises alternated with the conduct of business matters at the local meetings. It has especially been instrumental in promoting various legislative measures in the interests of the farming class. Among these may be mentioned the Provincial Drainage Acts (R. S. O. C. 37, 38), the Dominion statute known as the Butter Act, etc. On the tariff question the opinion of the patrons has been divided; it has been difficult for the Grange to adopt any decided position in the matter without identifying itself with party politics. The Grange was, however, instrumental in securing the repeal of the duty on binder twine. The patrons have constantly sought to foster the cheese industry and the cattle trade with Great Britain; have succeeded in having agriculture taught in the public schools; and have strongly supported the agricultural college at Guelph. The Grange has also agitated in favor of the inflation of the Dominion paper currency, the reduction of railroad rates and the appointment of a railroad commission. Consult Michell, H., 'The Grange in Canada' (Bulletin, Department of History, Queen's University, Kingston 1914).

Stephen Leacock,
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51. THE LABOR MOVEMENT IN CANADA. In Canada, as elsewhere, the labor movement has been shaped by political and economic environment. The presence of the French in Quebec has been an important factor. The existence of free land and the large part played by transportation and construction trades in a country of great distances and under rapid development are others.

The history of organized labor in Canada is in the main that of a series of outposts of the larger movements of Great Britain and the United States. The legislative aims of Canadian labor have been derived largely from the United Kingdom, but the working mechanism of trade unionism has come almost entirely, and especially in recent years, from the United States. Few data on the subject prior to Confederation (1867) exist. The newness of the country and the lack of industrial population were against organization. There were «labor circles,» so-called, in the province of Quebec as early as 1825. In 1827 a printers' organization in the city of Quebec took cognizance of wages and cared for its sick. A similar union among the printers of York was recorded when that municipality became the city of Toronto in 1834. The larger seaports, being the localities in closest touch with Great Britain, were the first to develop trade unionism. Prior to 1850, however, the movement was negligible. The railway and land «boom» of 1850-54 brought important changes, especially in Ontario, and there were strikes of printers, shoemakers and molders at Toronto in the latter year. The Typographical Union of the United States crossed into Canada in the sixties. But it was not until 1872, and the winning of a celebrated conspiracy trial arising out of a strike of printers at Toronto, and the passing by the Dominion government of «An Act respecting Trade Unions,» which repealed the harsh measures previously in effect against associations of employees (an echo of the repeal of the Combination Laws of England), that the labor movement had its real birth in Canada. In that year, which was the apex of a period of great industrial and commercial prosperity, the first general assembly of Canadian labor met at Toronto. It was attended by the representatives of 31 unions, though there were 70 unions in existence by that time in Ontario alone. The organization with some initial successes to its credit in securing legislation in the province of Ontario waned with the depression which followed the panic of 1873, and disappeared entirely three years later. In 1883, under more direct encouragement and support from the unions of the United States, the attempt to found a central labor body in Canada was repeated, this time with permanent success, and after 1886 «The Trades and Labor Congress of Canada» secured a firm place among Canadian institutions, holding annual meetings and consistently increasing in strength and influence ever since. Since 1900 alone the increase in the membership of the Congress and its adhering bodies has been tenfold.

The constitution and general position within the Canadian labor movement of the Trades and Labor Congress as it exists to-day is of considerable significance and interest. From the outset, as already remarked, the typical local trade union in Canada has been a branch of a large «craft» organization having its headquarters in the United States. Even where the parent body is British, the immediate affiliation has usually been from a continental head office situated in the United States. Canadian trade unionism, accordingly, has reflected rather accurately the conflicts and general fortunes of the unions of the neighboring republic. The Congress is in effect an organization on the federal principle of the Canadian members of the general international labor movement, for the purpose primarily of directing public opinion and influencing legislation in the Parliament of Canada and the legislatures of the several provinces, a function which obviously a foreign organization could not adequately perform. The Congress accordingly has always been closely allied with the federated bodies of the United States, deriving its revenues not only from its own members but by grant from the federal head bodies whose work it carries out in Canadian territory.

This status of the Congress has in large part determined its history. In the great conflict which was waged in the closing decades of the 19th century between the Knights of Labor and the American Federation of Labor for supremacy in the federal field of American trade unionism, the Congress at first held the balance even. Later on, however, with the increasing strength of the Federation, the influence of the Knights of Labor in the Congress declined. Eventually an open rupture occurred, and in 1904 the «Canadian Federation of Labor» was organized of unions cast out of the Congress on the ground of adherence to the principles of the defeated movement. The new organization adopted as its leading policy the fostering of a purely Canadian as opposed to an international trade union movement. Outside of the province of Quebec, however, where the Knights of Labor had attained an exceptionally strong position, no numerous following was obtained. The Federation has at the present time a membership of about 50 unions. There have always been, of course, a limited number of purely local organizations of labor in Canada, and even of central craft associations, outside the international movement. The boot and shoe workers and textile workers of the province of Quebec had at one time considerable organizations. The Canadian Brotherhood of Railway Employees has more recently become prominent, and there are at present at least 10 other Canadian associations of a central character. Of these the best known, both because of its history and its present importance, is the Provincial Workmen's Association of Nova Scotia, a body founded in 1879, originally of coal miners. After a career of 30 years replete with successes, the Association had established its influence throughout Nova Scotia, when a strike of the Dominion Coal Company's employees threatened to involve the great majority of its members and accordingly to place an undue strain on its resources. The incident is somewhat typical of organizations having a limited field of operations. It caused a section of the membership in the present case to look for help to the United Mine Workers of America, the international body established throughout the continent, which at once threw organizers into the field. After a bitter struggle of several years' duration, a compromise was effected in 1917, by which the two series of local organizations have become merged, but have continued on a Canadian basis. As to the present position of trade unionism in Canada, the following is a brief review:

Local Unions.— Beginning with the unit of trade union organization, namely, the local union,— usually the craft union — there were in 1916 some 1,842 bodies of this character in Canada. Of these, 1,626 were branches of international organizations, 189 were branches of purely Canadian organizations, whilst 27 were entirely independent and local. The total trade union membership was estimated at 160,407 in 1916, of which 129,123 was international. This does not represent the highest point reached by the Canadian labor movement; in 1913, there were 2,017 local unions and the total membership was over 175,000. By provinces, Ontario stands first with 753 unions, and Quebec second with 306. British Columbia follows with 202 and Alberta with 147. Manitoba has 130, Saskatchewan 116, Nova Scotia 100, New Brunswick 80 and Prince Edward Island 8. Trade unionism naturally predominates in the larger industrial centres, and 18 Canadian cities contain 828 of the 1,842 local branches, and over 40 per cent of the entire membership. Montreal with 127 unions, Toronto with 111, Winnipeg with 75, Vancouver with 56, Hamilton with 50, Ottawa with 46, Edmonton with 42 and London with 40 are the leading centres of the labor movement. The most highly unionized group of workpeople is the railroad employees, who constitute 30.5 per cent of all Canadian trade unionists. The clothing and boot and shoe trades account for 10.6 per cent of the locals and the metal trades for 9.5 per cent. Building trades and mining and quarrying tie for next place with 9.4 per cent each. The printing trades have 4.5 per cent. These proportions vary from year to year with general economic conditions. In 1914 the building trades made up 18.9 per cent of the total trade union membership, whilst the railway employees were at that time only 24.9 per cent.

With regard to the central international craft organizations, it may be noted that of a total of 143 operating on the North American continent, 91 are represented in Canada. The American Federation of Labor constitutes the federal head of 112 of these; within Canada 84 are in affiliation with the Trades and Labor Congress. Naturally the Canadian representation in the international movement is but a small proportion of the whole. It was estimated in 1916 that the American Federation of Labor embraced a total of 24,360 local branches, with a membership of 2,529,198. The Trades and Labor Congress of Canada could speak at the same time for 1,138 local branches having a membership of 66,573. Of the 91 organizations above mentioned, 41 have 10 or more branches in Canada. Those having 25 or more branches are as follows:

NAME OF ORGANIZATION	Number of Canadian local units	Reported membership of all units in Canada
Barbers' International Union of America, Journeymen	40	1,193
Bricklayers, Masons and Plasterers' International Union of America	56	3,755
Carpenters and Joiners of America, United Brotherhood of	101	5,000
Electrical Workers, International Brotherhood of	29	1,760
Locomotive Engineers, Brotherhood of	90	5,013
Locomotive Firemen and Enginemen, Brotherhood of	92	6,512
Longshoremen, International Association	26	1,600
Machinists, International Association of	69	7,108
Maintenance-of-Way Employees, International Brotherhood of	157	5,419
Mine Workers of America, United	25	4,426
Molders' Union of North America, International	31	2,152
Musicians, American Federation of	40	4,574
Painters, Decorators and Paperhangers of America, Brotherhood of	28	1,196
Plumbers and Steam Fitters of America, United Association of	40	1,827
Railway Conductors, Order of	61	3,026
Railway Carmen of America, Brotherhood of	73	4,658
Railroad Trainmen, Brotherhood of	86	10,684
Stonecutters' Association of North America, Journeymen	26	750
Typographical Union, International	44	4,647
Totals	1,114	75,300

Trades and Labor Councils.— These are the municipal parliaments of labor, of somewhat loose organization, supported by a small per capita assessment. They are most important bodies under the Canadian system. All matters of general as opposed to craft interests are particularly their concern. In 1916 they numbered 46, of which 42 were chartered by the Trades and Labor Congress and 3 by the Canadian Federation of Labor. Nineteen of the trades councils are in Ontario. Perhaps the most historic labor body in Canada is the Toronto Trades and Labor Council. It was the body chiefly instrumental in calling together the first congress of labor in Canada, and it represents to-day over 10,000 members of the rank and file.

Federal Councils.— Canada has also its quota of trade federations, i.e., local associations of the unions of similar or allied trades. Thus there are nine allied printing trades councils, six building trades councils, six federal councils of railway employees and four federations of theatrical employees. A considerable number of the craft unions have also what is termed «district councils,» which usually comprise all the branches of the same craft organization within the given area. Thus the Provincial Conference Board of Ontario of the Bricklayers, Masons and Plasterers' International Union is made up of 30 local unions scattered throughout the province. Similarly the United Mine Workers of Alberta and British Columbia have a district association. There are altogether 38 district councils of labor unions in Canada. It should be noted that in Canada as in the United States the large international railway organizations have been chary of entering into definite affiliation with the general labor movement. They are not represented for example in the Trades and Labor Congress. They maintain instead a series of "protective" and "legislative" committees. Certain of the railway organizations have special officers under salary to watch their interests during the sessions of the Dominion Parliament.

Beneficiary Work.— The beneficiary work of the Canadian unions is inextricably interwoven with that of the continental movement. It may be remarked that the total expenditures on benefits of the international organizations represented in Canada was $12,502,128 in 1916, of which the Canadian membership doubtless received its proportional share. In addition, the Canadian unions paid out independently and on a purely local basis the following sums:

Death benefits	$56,646
Unemployed benefits	2,121
Strike benefits	15,542
Sick benefits	146,592
Other benefits	27,279

Labor Legislation.— The main body of labor legislation in Canada is of provincial origin — the provinces being vested, under the British North America Act, with the protection of civil rights. In the rise and development of the factory system in the older provinces, and of the mining and construction trades there and elsewhere, will be found the conditions which have created most of the Canadian labor laws. Factories and Shops Acts exist in all the provinces, and Mines Acts in those which have an active mining industry. Acts defining the relations of master and servant and protecting the wages of the latter found their way into provincial statutes at an early date. In legislation of this character the model followed has been that of Great Britain. In workmen's compensation legislation, for example, marked diversity has resulted from the different pace with which the provinces have followed British precedent. The Dominion Parliament, however, as responsible for the peace, order and good government of the country, the regulation of trade and immigration and the scope of the criminal law, has also been largely interested in labor problems. A Dominion Department of Labor has existed since 1900, and has been the chief Canadian agency for the settlement of disputes between capital and labor. The evolution of the Dominion policy in intervention in labor disputes, culminating in the Industrial Disputes Investigation Act of 1907 — a measure which forbids a strike or lockout in the more important industries prior to investigation by a board of inquiry — constitutes perhaps the most interesting chapter in the subject of Canadian labor legislation. Labor departments in more or less developed form exist in most of the provinces.

R. H. Coats,
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CANADA HEMP, INDIAN HEMP, or **AMY-ROOT,** a perennial herb *Apocynum cannabinum* of the dogbane family (*Apocynaceæ*), a native of North America (British Columbia, Florida and Lower California) generally found growing along the banks of streams or in moist ground. It has a strong fibre used by the Indians for twine, nets, woven fabrics, etc. They root deep, the stem and branches are upright and the leaves oblong, lanceolate-oblong and ovate-oblong, acute or obtuse and mucronate at the apex but narrow and rounded at the base. Above they are glabrous and sometimes pubescent beneath and range from two to six feet in length and six inches to three feet in width. The cymes are dense; the pedicels short and bracteolate at the base; and the flowers are from two and one-half to three inches broad. The calyx-segments are nearly as long as the tube of the greenish-white corolla. Consult Britton, 'Illustrated Flora of the Northern United States and Canada' (New York 1897); Gray, 'Manual of Botany' (New York 1889), etc.

CANADIAN BOUNDARIES. See Boundaries of the United States.

CANADIAN CANALS. The outstanding feature of water transportation in Canada is the Saint Lawrence system of rivers and lakes stretching from the Strait of Belle Isle to the head of Lake Superior — a distance of 2,340 miles. The shoals of the Saint Lawrence River in Lake Saint Peter between Quebec and Montreal have been dredged to give a waterway with a minimum of 30 feet in depth. Above Montreal the difficulties to navigation begin, and here begin a series of canals which overcome rapids and other obstacles. This work of canalizing the Saint Lawrence was not effectively begun till about 60 years after the British occupation. The canal system then embarked upon has been subsequently improved and enlarged, and in 1875 it was decided to increase their depths to a minimum of 14 feet. There is a difference in level between Lake Superior and tidewater of 600 feet, the total length of the canalization at different points being 73 miles. The following gives a summary of traffic during the past five years: 1911, 38,030,353 tons, of which 20.5 per cent was freight of Canadian origin, and the balance American; 1912, 47,587,245 tons (19.7 Canadian); 1913, 52,053,913 tons (21.3 Canadian); 1914, 37,023,237 tons (25.3 Canadian); 1915, 15,198,803 tons (44.7 Canadian). It will be observed that 1915 shows the extraordinary decrease of 21,824,434 tons, or 58.9 per cent, over the figures of 1914. Of that decrease 91 per cent occurred at Sault Sainte Marie (see p. 477, Sault Sainte Marie Canal). The canals of Canada, like those of the United States, are free of toll or restrictions of any kind, and there is thus absolute reciprocity in the use made of them by the vessels of each nation. The following is a brief summary of the principal canals of Canada:

Saint Lawrence Canals.— The Saint Lawrence canals, Lachine, Soulanges, Cornwall and Williamsburg, had a total traffic of 3,409,467 tons in 1915, a decrease of 982,026 tons over the figures of 1914.

Lachine Canal.— This canal was built across a portion of the island of Montreal in order to avoid the Lachine Rapids. It was opened in 1824, and has been subsequently enlarged three times. The present canal has five locks 275 feet long, of which two have a depth of 18 feet of water on the sills.

Soulanges Canal.— Between Lake Saint Louis and Lake Saint Francis three rapids are passed — the Cascades, the Cedars and the Coteau. In order to avoid these rapids the Beauharnois Canal was built on the south shore of the river and completed in 1845. It was 11½ miles in length, with nine locks. The Soulanges Canal, completed in 1899, and built on the north shore, has now superseded the Beauharnois Canal. Its length is 14 miles, and it has a depth of 15 feet of water available on the sills.

Cornwall Canal.— The Cornwall Canal was built to overcome the Long Sault Rapids at the head of Lake Saint Francis. It extends from Cornwall to Dickinson's Landing, and was opened for navigation in 1843.

Williamsburg Canals.— These begin with the Farran's Point Canal, five miles above the Cornwall Canal, and are continued by the canals at Rapide Plat and the Galops. They were completed and opened for navigation in 1846-47, and have been recently deepened and enlarged.

Chambly Canal.— The Chambly Canal at one time formed an important link in the chain of communication between the Saint Lawrence and the Hudson River via Lake Champlain. A lock at Saint Ours, 14 miles above Sorel, was finished in 1839. The Chambly Canal was opened in 1843, but was improved in 1850, giving a navigable depth of about seven feet of water. The canal is 12 miles long, the connection from Lake Champlain being by the Champlain Canal, built in 1822. The Chambly Canal, owing to the building of railways and the increased draught of vessels, is now of little commercial importance, and is chiefly used by barges carrying lumber from the Ottawa River to New York. In 1915 478,707 tons passed through, an increase of 41,802 tons over the preceding year.

The Rideau-Ottawa Canal System.— This system was designed to provide safe water communication between Kingston and the lower Saint Lawrence by way of Ottawa (then called Bytown) and the Ottawa River. In its conception the requirements of commerce were secondary to military considerations. Water communications with Upper Canada had been seriously interrupted during the War of 1812, and the system was intended to form, so to speak, a back-door between the two great rivers. At Sainte Anne, where the Ottawa joins the Saint Lawrence, private interests had constructed a lock in 1816. Twenty-seven miles farther up the Ottawa, the Carillon Canal was built to avoid the Carillon Rapids; the Chute à Blondeau Canal four miles above that, and the Grenville Canal a mile and a half above the Chute à Blondeau Canal. The Ottawa River canals handled 272,370 tons of freight in 1915, a decrease of 62,762 tons in comparison with the preceding year.

The Rideau Canal, formed by canalizing the Rideau and Cataraqui rivers, and by making use of the Rideau lakes, was constructed as a military work, and was opened for navigation in 1832. The locks were 134 feet long by 33 feet wide, with five feet depth of water on the sills. In 1915 120,781 tons of freight passed through, a decrease of 30,958 tons from 1914.

Trent Navigation System.— A plan has been projected to construct a navigable waterway over 200 miles in length, connecting the rivers and lakes between the Bay of Quinte and the southeastern shore of Georgian Bay. In 1907 it was decided to proceed with the improvement of the Trent River from the Bay of Quinte to Lake Simcoe, with an eight and one-half-foot navigation to Rice Lake, and a six-foot navigation from that point to Lake Simcoe. Contracts were let to a value of over $5,000,000. Two great hydraulic lift locks have been constructed in connection with these works, the one at Peterborough being the largest in the world, and is able to lift vessels of a capacity of 800 tons vertically a distance of 65 feet. In 1915 49,904 tons passed through the Trent canals, a decrease of 17,811 tons on the figures of 1914.

Welland Canal.— This is the most extensive of the public works of this character undertaken by the Canadian government, and is designed to overcome the 27 miles that separate Lake Erie from Lake Ontario. The difference in level between the two lakes is 326¾ feet. The first canal was opened 27 Nov. 1829, and extended from Port Dalhousie on Lake Ontario to the Welland River, which was utilized as far as its outlet to the Niagara River. Vessels then ascended the Niagara to Lake Erie. In 1833 a diversion was made by extending the canal to Port Colborne on Lake Erie. In 1842 improvements and enlargements were made, and in 1875 a new cutting was begun from Allanburg to Port Dalhousie. In 1912 further enlargements were undertaken, at an estimated cost of $50,000,000. The present channel will be used from Port Colborne to Thorold, and from there a new cutting will be made to Lake Ontario, entering the lake about three miles east of Port Dalhousie. This canal will be 25 miles in length, and in place of 25 locks will have seven locks, all of which are to be between Thorold and Lake Ontario. Each lift lock will be 800 feet by 80 feet in the clear with 30 feet of water above the sills, and will have a lift of 46½ feet. Provision is to be made to admit of a future 30-foot navigation. It is believed the opening of the new canal will favorably affect wheat freights and will result in the diversion of much traffic from the Buffalo-New York route to the Saint Lawrence. In 1915 3,061,012 tons passed through the Welland Canal, a decrease of 982,026 tons on the figures for 1914.

Sault Sainte Marie Canal.— Built to overcome the falls and rapids of Saint Mary River connecting Lake Superior with Lake Huron, it was opened for navigation in 1895. This was not the first canal to be constructed, the Northwest Company having built a small canal at the end of the 18th century. The Sault Sainte Marie Canal has a lock 900 feet long with a width of 60 feet and depth of water on the sills of 18 feet 3 inches at the lowest known water level. In 1897, 4,947,065 tons of freight passed through the Canadian Canal, and by 1913 the tonnage had increased to 42,699,324 tons. These figures had declined in 1914 to 27,599,184 tons; and the following year, 1915, an extraordinary reduction took place, the freight passing through being only 7,750,957 tons — a decrease for the 12 months of 19,848,227 tons. Of the decline of traffic at this gateway, 1,049,241 tons (or 5.1 per cent) attached to Canadian traffic, and 18,798,986 (or 94.9 per cent) to American traffic. The decrease was largely in the nature of a diversion to the American Canal at Sault Sainte Marie. The cause of this diversion was the availability of a new lock on the American side, having a much larger capacity than the lock on the Canadian side. The practicability of carrying a heavier load through the new American lock drew away nearly all the iron ore trade and a good deal of wheat from the Canadian canal.

Saint Peter's Canal.— The Saint Peter's Canal connects Saint Peter's Bay on the Atlantic Ocean with Bras d'Or Lake, a salt-water estuary in Cape Breton Island. It was completed in 1869, was enlarged between 1875 and 1879, and has a lock 200 feet long, 48 feet wide, with 19 feet depth of water. A new entrance from the Atlantic is being made, with enlargement of the lock.

D. S. Douglas.

CANADIAN COPYRIGHT. See Copyright, Canadian.

CANADIAN EMBROIDERY, a kind of embroidery formed from small pieces of snake skin, fur, etc., intermingled with flexible pieces of split porcupine quills dyed in various colors.

CANADIAN GOVERNMENT RAILWAYS. The following lines were owned and operated by the Dominion government as the government railways in 1917: The Intercolonial Railway (1,562 miles), with which is associated the Prince Edward Island Railway (275 miles), the International Railway of New Brunswick (112 miles), and the Saint John and Quebec Railway (105 miles); and the National Transcontinental Railway, from Moncton, N. B., to Winnipeg (2,009 miles), giving a total of 4,063 miles. In 1917 a measure passed the Dominion Parliament providing for government ownership and operation of the Canadian Northern Railway. The Hudson Bay Railway, now (1918) in course of construction from The Pas, on the Saskatchewan River, to Port Nelson, on Hudson Bay, a distance of 410 miles, is to be operated as a government line. After the Canadian Northern Railway passes into government hands, there will remain only three lines of any importance under private ownership — the Grand Trunk, Canadian Pacific, and Grand Trunk Pacific railways. See separate articles on before-mentioned railways — Canadian Northern; Canadian Pacific; Grand Trunk; Grand Trunk Pacific; Intercolonial; and National Transcontinental.

CANADIAN NORTHERN RAILWAY. The Canadian Northern Railway system may be said to have had its origin in the construction in 1896 by Mackenzie and Mann, contractors, of a line of railway between Gladstone and Dauphin, in Manitoba, under the charter of the Lake Manitoba Railway and Canal Company. During the next few years construction was carried on under a variety of company names, but by virtue of an order in council, passed 13 Jan. 1899, the Canadian Northern Railway Company was brought into existence. In that year there were 252.6 miles in operation. In 1901 the lines of the Northern Pacific and Manitoba Railway Company in the province of Manitoba were leased for a very long term of years, and on 1 Jan. 1902, the last spike was driven upon a line connecting Winnipeg and Port Arthur, on Lake Superior, giving the Canadian Northern its own independent outlet from the wheat fields of the prairies to the cargo carriers of the Great Lakes. Since then the lines have been extended over the Prairie provinces of Manitoba, Saskatchewan and Alberta, to the Pacific at Vancouver and Victoria, and to the principal centres of Ontario and Quebec, while in Nova Scotia, Canadian Northern lines serve the Atlantic shore from Halifax to Yarmouth, and cut across the province to the Bay of Fundy side. To-day the system comprises more than 9,000 miles of line. It connects Atlantic and Pacific ports and serves centres containing 60 per cent of the population and producing 70 per cent of the manufactured products of the provinces of Ontario and Quebec; 97 per cent of the urban population of Manitoba; 97 per cent of that in Saskatchewan, and 90 per cent in Alberta; in British Columbia it opens up the North Thompson Valley to settlement, and serves anew the old places such as Kamloops, Ashcroft, Yale, Hope, New Westminster, Vancouver and Victoria — in all 78 per cent of the urban population of the province. It has contributed measurably to the prosperity of the Dominion through opening up vast areas to settlement, by encouraging immigrants to make the new country their home and by opening up timber and mineral-bearing lands to development. The possibilities for economical operation in the future are exemplified by the fact that this transcontinental line possesses the easiest gradient of any of the great systems on the continent of North America.

Collecting elevators for grain having 26 per cent of the total capacity of western Canada are served by the Canadian Northern Railway; licensed terminal elevators having 47 per cent of the total capacity in Canada are on the Canadian Northern Railway lines. Flour mills having 51 per cent of the total daily capacity of Canada are on the lines of the Canadian Northern Railway. In British Columbia the Canadian Northern Railway proportion is 90 per cent; in Alberta 44 per cent; in Saskatchewan 74 per cent; in Manitoba 81 per cent; in Ontario 34 per cent; in Quebec 90 per cent; in Nova Scotia 15 per cent. Lumber mills producing 30 per cent of the total output in Canada are served by the Canadian Northern Railway, while 32 per cent of the total is marketed by water. In British Columbia the Canadian Northern proportion is 34 per cent; in Alberta, Saskatchewan and Manitoba 70 per cent; in Ontario 33 per cent; in Quebec 28 per cent; in Nova Scotia 28 per cent. Pulp and paper plants having 53 per cent of the capacity of Canada are served by the Canadian Northern Railway lines. In Ontario the Canadian Northern proportion is 60 per cent, in Quebec 64 per cent and in Nova Scotia 50 per cent. The company owns 3,245,987 acres of land, 843,127 of which are prairie land.

Its grain elevator at Port Arthur is the largest consolidated grain elevator plant in the world — capacity 10,000,000 bushels. Its coal docks at Port Arthur, Ontario, have a storage capacity of 660,000 tons, an unloading capacity of 700 tons per hour and an annual capacity of over 1,000,000 tons. The shipping capacity of the Canadian Northern Railway ore docks at Key Harbor, on Georgian Bay, is 8,000 tons of ore daily.

The lines of the system are located as follows: Nova Scotia, 369.90 miles; Quebec, 626.77 miles; Ontario, 2,219.10 miles; Manitoba, 1,989.10 miles; Saskatchewan, 2,178.10 miles; Alberta, 1,181.21 miles; British Columbia, 516.40 miles; State of Minnesota, 215.42 miles; a total of 9,296 miles.

During the fiscal year ended 30 June 1916, the Canadian Northern Railway system carried 9,384,056 passengers, and 13,353,381 tons of freight. The gross earnings for that period were $35,476,275.06, the expenses $26,102,744.52, and the net earnings $9,373,530.54. There has been expended upon the construction of the system $433,918,288.18, and upon equipment $60,844,201.16, a total of $494,762,489.34. The head office is located at Toronto. In 1917 a measure passed the Dominion Parliament providing for government ownership and operation of the Canadian Northern systems.

CANADIAN PACIFIC RAILWAY, The. A Canadian railway running across the continent from Saint John, N. B., on the Atlantic, to Vancouver, B. C., on the Pacific, with lines owned or leased, running from Montreal to Quebec, Ottawa, Toronto, London and Windsor, on the Detroit River, and branch lines throughout the provinces of Ontario and Quebec; with other branch lines to various points in New Brunswick; with a network of lines throughout the Canadian West and British Columbia, including the Souris branch, the Manitoba South Western, the Manitoba & North Western, the Great North West Central, the Crow's Nest Pass and Columbia & Kootenay lines, the Calgary & Edmonton, the Columbia & Western and many others; making a total mileage of 12,917 covered by the traffic returns of 30 June 1915. Other lines worked by the railway at that date aggregated 383 miles, and there were under construction 60 miles, while the mileage of the Minneapolis, Saint Paul & Sault Sainte Marie Railway and the Duluth, South Shore & Atlantic Railway (lines controlled by the Canadian Pacific) was 4,103 and 626 miles, respectively; a grand total of 18,090 miles of road built, acquired, leased or controlled since the company was chartered early in 1881. Construction of the main line was commenced in June 1881 and completed on 7 Nov. 1885.

By the terms of the government contract with a company whose directorate included George Stephen (now Lord Mount Stephen), Donald A. Smith (afterward Lord Strathcona and Mount Royal), Richard B. Angus, and others, it was agreed to build a railway from Callander, in northern Ontario, to the Pacific, for a consideration of $25,000,000 in money and 25,000,000 acres of selected land, together with various privileges as to right of way, etc.

The original share capital of the company was $5,000,000, increased in 1882 to $25,000,000, and then to $100,000,000, of which $35,000,000 was canceled in 1885. Various financial changes and difficulties occurred during construction, and it became necessary to secure government loans of $30,000,000 in 1884, and $5,000,000 in 1885; these loans were repaid in full and the efforts of the promoters and management of the railway were eventually crowned with success.

By owning and operating all of the adjuncts of the railway service — telegraphs, express, sleeping cars, dining cars, grain elevators, as well as hotels at the leading points, steamship lines on the lakes and on the Pacific and Atlantic oceans, the Canadian Pacific adopted special methods of management which have worked out to the material advantage of the company.

According to its statement of 30 June 1911, the cost of the railway and equipment was $503,584,724 and of its various steamship lines $24,208,595. It then held in Manitoba, Western provinces and in British Columbia 8,214,186 acres of land. Its capital stock was $200,000,000, receiving dividends at the rate of 10 per cent per annum; its 4 per cent preference stock, $80,681,921; its 4 per cent consolidated debenture stock, $176,284,882; its bonded debt, $6,399,180; 6 per cent note certificates, $52,000,000.

The company issued $25,000,000 5 per cent land grant bonds in 1881, which have been paid off. In 1888 a further issue of $15,000,000 3½ per cent land bonds was made, and of these $3,500,000 had been provided for at 30 June 1904 by payment of that amount to the government out of the proceeds of land sales in terms of the mortgage, leaving $11,500,000 outstanding. These were afterward paid off.

The following table illustrates the diversified nature of its traffic during the three years, each ending June 30:

Description of Freight Carried	Year ended June 30th		
	1902	1911	1915
Flour, barrels....	4,921,993	8,469,744	8,538,600
Grain, bushels...	52,719,706	111,169,982	126,909,828
Live stock, head.	963,742	1,567,665	2,833,726
Lumber, feet....	1,033,569,377	2,441,007,107	2,180,735,600
Firewood, cords..	204,963	298,345	254,428
Manufactured articles, tons...	2,288,234	5,759,344	6,024,590
All other articles, tons..........	2,571,136	8,971,037	7,423,163
Freight traffic			
Number of tons carried........	8,769,934	22,536,214	21,490,596
Of tons carried 1 mile..........	3,247,922,167	8,062,102,013	7,940,151,342
Earnings per ton per mile.......	$0 75	$0 81	$0 76
Passenger traffic			
Number of passengers carried..		12,080,150	13,202,603
Number of passengers carried 1 mile....................		1,457,332,932	1,164,488,630
Earnings per passenger per mile.		$1 93	$2 06

The gross earnings of the system for the year ending 30 June 1915 were $98,865,209, and the working expenses $65,290,582, with net earnings of $33,574,627.

Lord Mount Stephen, the first president of the company, resigned from that office in 1888 and was succeeded by Sir William C. Van Horne, who retired in 1899, when Lord Shaughnessy, K.C.V.O., the present president and chairman of the company, became his successor. The general offices of the company are at Montreal, Canada.

CANADIAN RIVER, a river that rises in the northeast part of New Mexico, and runs generally eastward through Texas and Oklahoma to the Arkansas. Its length is about 900 miles, but it is rather shallow and not important for navigation. Its largest tributary is the

Rio Nutria, or North Fork of the Canadian, which runs parallel to the main stream for about 600 miles.

CANADIAN SERIES, the lower of the three series into which the rocks of the Ordovician system are divided by American geologists. It comprises the Chazy and Calciferous stages, principally limestones. See ORDOVICIAN.

CAÑAIGRE, kăn-yī'-grā, a species of dock (*Rumex hymenosepalus*) indigenous to the arid region of southern California, Arizona, New Mexico, northern Mexico and western Texas. It is a perennial herb with tuberous roots from which a reddish or green stem rises to a height of about two feet and bears rather large leaves resembling those of other docks. The tubers, which resemble those of the dahlia, have long been used locally as a source of tannin, and attempts have been made to grow them upon a commercial scale for this purpose.

CANAJOHARIE, kăn'a-jō-hă're, N. Y., an Indian word, meaning, "The pot that washes itself." A village on the south bank of the Mohawk River in Montgomery County, 55 miles west of Albany, in the most picturesque part of the Mohawk Valley. Canajoharie was first settled about 1740 by the Dutch and Germans. It was the home of Brant, chief of the Six Nations, and place of departure from the Mohawk to the southern interior. The Erie Canal, the New York Central and West Shore railroads pass through the village. The village has two banks, a library, six churches and a school of high standing; two weekly local newspapers and one hay-trade publication; flour mills, limestone quarries, paper and cloth bag manufactory and meat and fruit packing-houses. It is equipped with electric light and power, sewers and an abundant water supply. It is governed by a board of trustees and a council of five members, elected annually. Pop. (1916) 2,500.

CANAL DOVER, Ohio, city of Tuscarawas County, 70 miles south of Cleveland, situated on the Tuscarawas River and the Ohio Canal, and on the Pennsylvania and Baltimore and Ohio railroads. There are deposits of coal, iron and building stone in the vicinity. The city owns and operates its waterworks and electric lighting plant. The chief industries are in iron and steel, and the manufacture of racing-sulkies, baby-carriages, roofing, etc. Pop. (1910) 6,621.

CANAL DU MIDI, or **CANAL DU LANGUEDOC**, a canal in the south of France, connecting the Mediterranean Sea and the Atlantic Ocean. See CANALS — HISTORICAL.

CANAL RING. See TILDEN, SAMUEL J.

CANAL ZONE BOUNDARY. See BOUNDARIES OF THE UNITED STATES.

CANALE, kă-nä'lĕ, **Nicolo**, Venetian admiral, who flourished in the second half of 15th century. In 1469 he was commander of the Venetian fleet at Negropont (the ancient Chalcis), and succeeded in seizing the Turkish town of Enos. The cruelties perpetrated upon the inoffensive inhabitants created great indignation at Constantinople, and Mohammed II, with a view of resenting the outrages, besieged Negropont with a force of 120,000 men, and after a violent contest expelled the Venetians. Canale, to whom this defeat was attributed, was sentenced to death by the Council of Ten, but at the instance of Pope Paul II and of other influential persons, his punishment was commuted to exile for life.

CANALEJAS, kă-na-lā'hās, **Don José**, Spanish statesman: b. 1854; d. 12 Nov. 1912. The son of humble parents, he was originally trained for the law, but took to politics at an early age. Working his way up the political ladder he held several portfolios, including those of Finance and Justice, and was for a time President of the Chamber. In February 1910 he was called by King Alfonso to succeed Señor Moret, the Premier, whose administration had lasted only four months. Moret had bitterly attacked the Maura ministry on the campaign in Morocco and their strong action in suppressing the Barcelona riots. Maura was compelled to resign and Moret, a Liberal, assumed office, but was soon forced to resign owing to dissensions in his party. Canalejas was called to the helm and formed his Cabinet in one day, distributing the portfolios among the Democrats, of which party he was the leader. On 15 June 1910 he disclosed his policy in the King's speech, which, whilst containing expressions of filial consideration for the Pope, clearly indicated that the government intended to take action against "unauthorized" religious orders and congregations. Canalejas speedily found himself in conflict with the Vatican when he canceled the prohibition, which was then in force, of the use of "any emblem, attribute, or lettering" on the exterior walls of Protestant places of worship. A number of prominent Carlists seized the occasion to send a testimony of their regard to Don Jaimé of Bourbon, son of the late pretender, Don Carlos. Don Jaimé, however, wisely repudiated any intention of disturbing the peace of Spain. The financial policy of Canalejas also ran counter to vested interests. Among his proposals was a tax on sums bequeathed for masses for the souls of the dead. A grave political crisis shook his administration early in 1911, when the question of the execution of Ferrer was revived. The responsibility for that sentence, however, did not rest upon Canalejas, for he was not in office when Ferrer was shot. In a speech he stated that he would have been in favor of a reprieve — as a matter of policy — which offended the military authorities. The War Minister sided with the army, but the King and the Cortes supported the Premier. Barcelona was said to be the home of 10,000 anarchists. In September 1911 these malcontents broke out in fierce riots, which spread with alarming rapidity. Canalejas was equal to the occasion. He proclaimed martial law throughout the country, seized the ringleaders and broke up the menace in a few days. A democrat in sentiment, his sense of justice was strong, if severe. He resigned twice because the king hal reprieved criminals condemned to death for atrocious murders. The king wished to bestow a title upon him, but the honor was refused by Canalejas, who said he preferred to remain associated with the proletariat from whom he was sprung. While looking in the window of a bookstore he was shot and killed by an anarchist.

CANALETTO, or **CANALE,** name applied to two Venetian painters: (1) ANTONIO, b. 18 Oct. 1697; d. 20 Aug. 1768, first followed his father's profession as scene-painter, but having studied in Rome, where he employed his time depicting ancient ruins in studied light and shade effects. He was the first to employ the camera obscura practically. He returned home and devoted his work to views of the palaces and scenes of Venice. which he painted with fine perspective, a clear and firm touch and an excellent mastery of color. He has been given both favorable and unfavorable criticism, the latter for the mechanical nature of his art. The National Gallery, London, has five pictures by him, among them 'View on the Grand Canal, Venice' and the 'Regatta on the Grand Canal.' (2) BERNARDO BELLOTTO (q.v.) nephew of the former, also a landscape painter, who imitated his uncle and master. He lived in Dresden where he was a member of the Academy of Painters.

CANALS. Canals are waterways, wholly or partially artificial, used for conveying water or for providing navigation. Those used for irrigation, drainage and water-power development are of the first class and, being closely related to the subjects of their purpose, are not considered here.

Navigation canals have been designated according to the size or kind of boats that can navigate them, as boat, barge or ship canals; according to the nature of the channel, whether purely artificial or in natural streams, they have been known as artificial canals or canalized rivers; and according to geographical location they have been called isthmian canals, peninsular canals, canals around falls or rapids, artificial seaport canals or canals connecting waterway systems. Also there are sea-level canals — built at sea level — and tidal canals, which are sea-level canals subject to tidal flow.

The term ship canal is commonly applied to those canals intended for ocean-going vessels, but the other terms — boat and barge — are not so generally used, probably because they fail to convey any definite idea as to size. However, the term thousand-ton barge canal, which was used to designate one particular canal, gives a fairly close idea of the boats that can be accommodated. As no standard of size has ever been or is likely to be established, the size of a canal is truly defined only by stating the maximum dimensions of the boats that can be accommodated. These are usually given in terms of draft, beam and length, but sometimes the form of bow and stern must also be considered.

Until a few years ago the great majority of canals were of small size, and before the advent of the lock, unless a canal could be built at one level, the boats used were limited to a size which could be transferred from one level to another by some mechanical device. After locks came into use, France, in the 17th century, undertook considerable canal construction. England followed next, but did little until the latter half of the 18th century. Early in the 19th century the beginning of canal construction was witnessed in America. This was all prior to the coming of railroads and at a time when canals furnished the only cheap means of transportation. The sizes of the canals up to this time seem, in the light of present dimensions, but very small. During the latter part of the 19th century several of the European countries began enlarging and improving their more important canals, making some radical changes in size and in manner of construction and operation. These changes were worked out by careful study, made in accordance with modern scientific methods rather than by the rule-of-thumb procedure of former years. American waterway improvement along modern lines did not become very active until the beginning of the present — 20th — century, but now various Federal projects, also the Panama Canal and New York State Barge Canal have caused a reawakening of canal construction in America.

The artificial channel, which among engineers is now known as a land-line, was the prevailing type of construction for many years, even where the route was parallel and in close proximity to a natural stream, as was often the case. To control a river sufficiently for navigation by small boats was often considered impracticable and the cost, prohibitive. The liability of damage to canal structures by floods and the damage to adjacent territory resulting from backwater caused by canal structures at flood time argued against the use of the natural channels. Later, when larger canals were built and methods for the control of rivers were improved, it became more economical to utilize the natural channels, where available.

Isthmian and peninsular canals, so called from the neck of land crossed, provide shorter and safer routes between certain ports. Canals around falls or rapids connect navigable portions of a river above and below the fall. There are several of these on the Saint Lawrence River. Artificial seaport canals extend from the coast inland and are designed to permit sea-going vessels to reach inland ports. Canals connecting waterway systems enable boats to pass from one system to another, thereby increasing the utility of both systems, and often also they possess other features of much importance.

Of canal structures, the most important probably is the lock, a device to raise or lower boats from one level to another. A lock, placed at the meeting of two canal levels, is simply a chamber or basin which has a gate or set of gates at each end and side walls extending from a little above the water-surface of the higher level to the bottom of the lower level. When a boat enters a lock the closed gates at the other end maintain the difference in elevation between the two levels. After the gates are closed behind the boat, water is admitted to or drawn from the lock chamber, so as to raise the boat to the upper level or lower it to the lower level. Then the gates ahead of the boat are opened and it passes to the new level, the point of difference in elevation between the two levels having been transferred to the gates through which the boat entered the lock.

Various kinds of lock-gates have been employed, the most common being the mitre-gate. This consists of two leaves swinging on vertical axes from the side walls and meeting at an angle in the centre with the apex toward the upper level. Wood was the material formerly used for mitre-gate construction, but now steel is generally used. Improvement in gate design has made possible locks of more than 40 feet lift, whereas 10 or 12 feet was the usual maximum. The tumble-gate, sometimes used at the upper end of the chamber, is mounted on a horizontal axis at the bottom and is raised or lowered mechanically. Lift-gates, which can be raised high enough to clear the boats, and rolling-gates, which roll back into a recess formed outside the lock at right angles to the side wall, have also been used.

On the smaller locks, when mitre-gates were used, the water in the lock chamber was controlled by means of wickets or valves in the gates, but where the other kinds of gates are used and in all large locks, culverts are employed. These are built in the side walls or under the floor of the lock chamber, and in the larger locks usually extend just beyond the gates at both ends of the lock, connecting with the pools above and below the lock. They have several openings to the lock chamber, in order that the lock may be filled or emptied in a reasonable time with the least disturbance to the craft in the lock. The flow in these culverts is usually controlled by means of lift-gates or valves, located near each end. The Stoney gate, which operates on a nest of rollers, is being used largely on the New York State Barge Canal. There are a few instances of locks in which the culvert has been formed near each end into a siphon that has its neck above the highest water in the upper pool. A closed tank built in the masonry, which is filled from the upper pool and has an outlet to the lower pool and air pipe connection with the neck, primes the siphon, the water flowing from the tank tending to create a vacuum, which is filled by air from the neck.

The quantity of water required for one complete lockage is equal to the volume of the lock chamber between the elevations of the two pools. However, when the lockages alternate up and down, this quantity of water will serve to lock a boat each way. Where conditions permit, a saving of water is sometimes effected by the construction of a side pool. When the lock is to be emptied, some of the water is drawn into the side pool and retained above the level of the lower pool, thereby being available for filling the lower portion of the lock chamber at the next lockage. Evidently the quantity of water thus saved must be somewhat less than half the quantity required for one lockage.

There are a few examples of another type of lock — a structure consisting of a tank into which the boats pass and which is raised or lowered by power. Gates are provided at each end of the tank and also in the canal adjacent to the tank. Sometimes two tanks are operated side by side on a kind of balance. Since the weight of a tank and its contents is nearly constant, very little power is required and that mostly to overcome friction. With this type no water is consumed for lockage and but a small amount for power. On account of certain structural difficulties, however, very few locks of this variety have been built.

Inclined planes have been used occasionally in small canals in place of locks, the boats being hauled out of the water and up or down the incline in a saddle. Obviously these are not suited to large boats on account of the difficulty of safely supporting the boat and also because of the great amount of power required.

Of the other structures used in canals the movable dams deserve special mention, because of the part they play in the utilization of natural streams for canal purposes. These structures are designed to fulfil all the functions of a fixed dam, when it is desired to maintain the pools for navigation, and at other times, when a fixed dam would cause excessive floods, to be capable of being removed from the channel area either by being lowered to the river bed or by being raised above the flood level. Many kinds have been devised and used, the bear trap, of which there are several varieties, the Chanoine wicket, the Boulé gate, the Taintor gate, the rolling drum and the Poirée needle dam being best known. Boulé gates are often used in connection with a sort of bridge superstructure, forming what is commonly called a bridge dam.' Many types of automatic crests and also of controlled flashboards have been devised for special cases, to serve partially the same purpose as the movable dam, but their use is less general.

In the operation of the larger canal structures mechanical power has almost entirely superseded hand-operation. The great advances made in the development of electrical equipment render electric power particularly suitable for canal service. Also by its use the best means of lighting for night operation can be obtained. Where water power is available at a lock, a hydro-electric plant may be installed. In some cases, where power may be needed at times when water power is not available, as at movable dams, the electric generators are driven by gasoline engines. Electric power has the advantage of ease in distribution to points where it is needed and also flexibility in the amount employed. In addition, the modern equipment for lock operation is damaged very little by flood water. The equipment is often quite extensive, as on the Panama locks at Gatun, where all the operations are indicated on a board or diagram, which automatically shows the position of all the moving parts of the locks at all times.

Any project for canal construction must necessarily be considered from three standpoints — the commercial, the engineering and the financial. From these standpoints there must be considered not only the subjects that have already been discussed, such matters as terminals, power-supply and types of locks, dams and a host of lesser structures, but also the more general problems that arise in canal-building, and which remain for discussion.

These problems are so many and so interdependent that they do not readily lend themselves to brief classification. However, under three main heads — (1) dimensions, (2) route and (3) water-supply — the most important can be considered.

1. Several elements enter into a determination of the dimensions for a canal. In general a large boat can carry freight cheaper than a small boat, but unless the traffic is sufficient and of the proper kind to keep the large boat working to capacity, a canal of large size is not economical. A canal often terminates at a large lake or river or at the ocean. The question then arises as to whether it is advisable to make the waterway to fit the boats which

navigate these adjacent channels or to use smaller boats and transfer the cargoes. The nature of the territory traversed is also a determining factor. If natural waterways are available, then a larger channel may be desirable, since it can be made without excessive cost and will permit greater speeds. The necessity of bridges has a bearing on the subject. If they must be fixed bridges, the minimum clearance tends to limit the boat dimensions and through them the channel dimensions.

Until recent times the question of speed has not had much bearing on canal dimensions. On the old and small canals the permissible speed did not exceed three and a half or four miles an hour, this limit being necessary because of injury to the banks by wave action. Since larger channels and canalized rivers have come into use, higher speeds are obtainable. Just how high speeds will eventually be attained is hard to say. The economical speed probably has not yet been worked out; at least it is not generally recognized. Doubtless higher speeds are attempted than are warranted economically. In a restricted channel, such as most canals must necessarily have, the power required for a speed in excess of about five miles per hour increases much more rapidly than does the resulting speed attained. The necessity for a considerable amount of water under the keel has not been appreciated by canal boatmen of the old order. They have usually crowded the channel dimensions beyond a reasonable limit by the boats they have used, not realizing that they were defeating their own ends by increased cost for traction. On some of the recently improved canals the allowable speeds change with the locality. For example, on the New York Barge Canal they range from 4 to 10 miles. From this discussion it appears that, if a given speed must be attained on a canal, then the channel dimensions must be planned accordingly.

Closely allied to the question of speed is that of power. In the primitive canals man furnished the motor power, pushing the boats by poles, rowing them or drawing them by ropes from the banks. Then came the use of animals on a towpath. This was the common method until the modern era of improvement. Sometimes locomotives have replaced the animals. Steam propulsion has been in use to a limited extent on various canals for many years. Experiments in electric propulsion have been numerous, but no very successful system has yet been developed. A cable or a chain along the bottom of the canal has been used in some places, especially in Europe. These are either gripped or wound over a drum on the boat. According to modern methods canal boats are self-propelled or move in fleets of one power boat and one or more consorts. The newer canals are not provided with towpaths.

2. The early canals followed the natural contours of the ground much closer than do modern canals. Because of difficulties connected with stream canalization, preference was usually given to the building of independent channels, which often were close to but slightly above the streams. As previously stated, modern practice favors river canalization. After certain general features of location have been determined by commercial and broad topographical considerations, the detailed location of a canal is distinctively a technical problem, in which questions of engineering expediency and relative costs play the chief part. The desiderata sought in canal location are shortness of route, minimum of curvature, least number of locks, all possible elimination of intermediate summit levels, minimum of excavation and embankment, avoidance of a channel above surrounding country, greatest ease of excavation consistent with stability, suitable foundations for structures, accessibility to water-supply, least interference with adjoining private, municipal and industrial interests, utilization of natural water courses, etc. This subject of location, like that of dimensions, is complicated. Only by careful surveys and comparative plans and estimates can the questions be solved.

3. The supplying of water is one of the most important problems connected with canals. In the old canals, which were generally small and ran beside natural streams, the water requirements could be readily met by damming the stream and leading a short feeder to the canal. Under more difficult conditions, lakes or artificial reservoirs and sometimes long feeders have to be resorted to. It is almost essential that the supply be such that it can reach the canal by gravity flow, since in a canal of any magnitude the question of pumping is seldom to be considered.

Water has to be supplied to canals for three main purposes, namely, to fill the canal prism and to replenish loss in the levels between locks; to furnish water sufficient for lockages and for unavoidable leakage at locks; and to furnish power for operating the machinery at locks and other structures, and for electric lighting along certain portions of the canal, particularly at the locks.

An independent water-supply for filling the canal prism is required only in land-lines and then only at the opening of navigation or after water has been drawn out of the levels for repairs or other purposes. In river-lines the natural flow of the stream will, of course, fill the canal prism. The losses in land-lines include seepage through embankments, waste over spillways, evaporation from water-surfaces and transpiration through aquatic plants. For river-lines there is less waste through seepage and none over spillways.

The amount of water required for a lock varies not only with the height of the lift, but also with the volume of traffic. The same quantity of water is used in lockage, whether the boats are large or small and whether the lockage is up or down. Therefore the efficiency, or economy, of the lifting operation is increased with the larger boats. For a given amount of traffic the water-supply varies according as the boats are large or small and according to the manner in which they pass the lock — whether singly or in groups and whether lockages in the same direction are made in sequence or alternate with lockages in the opposite direction. A canal is essentially an inland transportation line in which the grades are overcome by water-power. That the power is applied directly from water to boat does not alter the case. All things considered, the canal lock is a fairly efficient water-driven machine. In addition, the lock has the advantage of simplicity, quick operation and avoidance of strain on the boat.

The critical points of supplying water to canals are usually the summit levels. Although lower levels may require more water, it is generally more readily obtainable for such portions, especially under the modern method of stream utilization. Proceeding downward in either direction from a summit, the water-supply required at any lock is equal to the sum of the losses from the source of supply down to the lock, plus the water required at the lock, minus the natural inflow, if any, between the source of supply and the lock. From this it appears that the water-supply required may vary greatly from point to point. In providing water for a summit level of a canal it is necessary, therefore, to obtain a supply adequate for the points of greatest demand on both sides of the summit.

Thus it will be seen that the problem of estimating the water-supply required by a canal, like the problems already discussed, is also complicated. Many items can be determined only approximately. It is necessary to allow a liberal excess, or reserve supply, as a factor of safety.

Historical.— The earliest artificial water channels were for irrigation and drainage; not to reclaim swamp land, other soil being too plentiful, but to regulate the overflow of rivers. These date from an immemorial past, certainly 3500 B.C. in Babylonia and Egypt, more probably 7000 at least. Very early also the larger ones must have been used for boat navigation, to transport agricultural and building materials; these combined drains and canals still exist in England, called «navigations,» and the workers on them «navigators,» and have given to the language the word «navvy» for construction laborers. At what period the first ones were dug primarily for navigation, and incidentally for irrigation, cannot be told. There is a tradition that the Suez Canal was dug under the old kingdom of Egypt before 2000 B.C.; it was certainly opened or reopened for small boats by Necho, about 600 B.C. About this time also Nebuchadrezzar of Babylon opened the Royal Canal between the Tigris and Euphrates, but Mesopotamia had been well canalized before. These two countries, indeed, invited canals, with their flat surface and long levels, and easy digging in sand or clay. It is probable that China also had canals before the Christian era, but evidence is wanting. The first canals were of course on one level; but with the light boats and great engineering skill of the ancients the step was not long to damming the water at different levels and hauling the boat over. The first system, not yet disused, was to pull the boat up an inclined plane and let it down by gravity; and this remained the only available method till modern times. Under Alexander and his successors in Egypt and the Seleucid empire canals were much used: an important one was from Alexandria to the Nile, whose mouths were shut off by sandbars. Marius had one constructed 102 B.C. from the lower Rhone to the Mediterranean. Under Claudius there was one from the Tiber to the sea; and in Great Britain there are two which date from the Roman time, the Foss Dyke and the Caer Dyke, in Lincolnshire, of 40 and 11 miles respectively. In the 4th century Lombardy was canalized,— a very favorable spot from its great plain and many rivers; and near the end of the 5th century Odoacer carried one from the Adriatic to Mentone above Ravenna. The downfall of Roman civilization stopped their development for a while; but under Charlemagne a fresh extension began, that monarch building canals to connect the Danube both with the Rhine and the Black Sea. In the Netherland bogs the system is that of nature itself, and began very early; here the canal is not so much an artificial channel as a remnant of the original sea, around which the land is built. In Britain as early as 1121 Henry I deepened and made navigable the old Foss Dyke. The Grand Canal of China, about 1,000 miles long, a large part of it made up of canalized rivers, was completed in 1289. That country has many other great systems connecting its internal waterways.

But obviously the boats transferable by such machinery must be small and lightly loaded; and the modern canal system, with long, heavy boats and large cargoes, was first made possible by the invention of the lock. This doubtless developed out of putting dams close together with gates in them; but neither inventor nor even country of first use is certain. It has been claimed for two brothers, engineers at Viterbo in Italy, in 1481; also for Leonardo da Vinci, the universal genius; and again for Holland a century earlier. The one certain fact is, that in the latter part of the 15th century they were in use in both countries, and spread rapidly through Europe. The first country to undertake on a large and systematic scale the connection of its leading systems by canals was France, in the 17th century. The Brière Canal, connecting the Seine and Loire, was begun in 1605 under Henry IV, and completed 1642 under Louis XIII. The Orléans Canal, uniting the same basins by the Loing, was completed 1675, under Louis XIV. The greatest of all, the Languedoc Canal, to connect the Bay of Biscay with the Mediterranean, was finished 1681. It is 148 miles long, 6½ feet deep, with a summit level of 600 feet; has about 119 locks and 50 aqueducts, and floats barges of 100 tons. France in 1879 passed a law making all its canals uniform at 6½ feet deep, with locks 126½ feet long by 17 wide. England was much later in taking up the system on a large scale, but when it did so, carried out a remarkable one, with great feats of engineering. The fathers of it were Francis, Duke of Bridgewater and his famous engineer, James Brindley; and the beginning was the charter for the Bridgewater Canal in 1759. The names of Watt, Telford, Nimmo, Rennie and other noted engineers are associated with it. The last inland canal in Great Britain was built in 1834. Among the leading ones are the Grand Junction, 128 miles; Leeds & Liverpool, 128; Trent & Mersey, 93; Kennet & Avon, 57. The great Irish canals are the Grand Canal, from Dublin to Ballinasloe, 164 miles, uniting the Irish Sea to the Shannon; and the Royal Canal nearly parallel to it for the same traffic, from Dublin to Torinansburg, west of Longford. The great canals of Scotland are the Caledonian and the Forth & Clyde, described under SHIP CANALS. Early in the 18th century Peter the Great constructed a great system of canals and canalized rivers, 1,434 miles long, to connect Saint Petersburg with the Caspian. The Danish Canal, 100 miles long, from the North Sea to the Baltic, was finished in 1785. The Gotha Canal, 280 miles long, connecting Stockholm with Gothenburg across Sweden, was planned 1716, but opened the first part 1810, the whole 1832. In 1836-46 Louis of Bavaria revived Charlemagne's old plan, connecting the Main (and so the Rhine) with the Danube, by a canal 108 miles long, 650 feet above the Main, and 270 feet above the Danube.

United States Boat Canals.—The first canal in this country was built in 1793, around the falls of the Connecticut River at South Hadley Falls, Mass.; the engineer was Benjamin Prescott of Northampton, afterward superintendent of the Springfield armory. The lift was not by locks, but by inclined planes, the boats being run into a movable caisson, filled with water and hauled up by cables operated by water power; locks were introduced later. In 1796 a canal was completed around Turner's Falls farther north in the same river, at Montague. "The Proprietors of the Locks and Canals on Merrimack River" were incorporated 1792, and opened their canal around the falls at Lowell to the mouth of the Concord, one and a half miles long and with four locks, in 1797; it was for the lumbering business, rafts, masts, etc. But the first general canal for passengers and merchandise opened in the United States was the Middlesex, a rival to the last, incorporated 1793, and completed 1804 at a cost of $700,000; it ran to Charlestown, 31 miles, was 24 feet wide and 4 feet deep, and fed by the Concord. A packet boat, the *Governor Sullivan,* plied regularly between Boston and Lowell, taking nearly a day. The first boat voyage to Concord, N. H., was made in 1814, and a steamer began passages in 1819. The canal was disused 1851. But much broader projects had been set on foot about the time of these local ventures; and several of the greatest afterward carried out, as well as some which have been chimeras rather from political developments than from any inherent impracticability, were broached even before the Revolution. Washington was deeply interested in canal schemes all through his life, and favored canals to connect all the great American water systems. The Potomac and Ohio, the James and Ohio, and the Mohawk Valley and Great Lakes connections, were all examined by him. The last named he looked over during the Revolution. In 1792 the Western Inland Lock Navigation Company was formed, and by 1797 had finished six miles of canals around the rapids at Little Falls, making a navigable way for 15-ton barges to Lake Ontario. Pennsylvania built several small canals in the two decades from 1790 to 1810, but they had little success. In 1784 Maryland and Virginia jointly granted a charter for a canal from Georgetown on the Potomac to the Alleghanies, under which up to 1822, when it was abandoned, some three-quarters of a million dollars were spent in excavations, dams and locks.

Chesapeake and Ohio.—The fortunes of this system have shown how difficult it is to forecast business developments. As designed by Washington, it was to connect the Chesapeake and ocean navigation, by way of the Potomac, with that of the Ohio, by portages and high-roads from its terminus, Cumberland, at the foot of the Alleghanies; as a fact, its use has been mainly from the accidental fact that Cumberland is near the Pennsylvania coal fields. The fortunes of the first company have been described. In 1823 commissioners appointed by Maryland and Virginia reported in favor of a new route in place of attempting to complete the old one; in 1824 the national system of internal improvements was inaugurated by act of 30 April, and a board of engineers in October 1826 reported on a canal from Georgetown to Pittsburgh. As the cost was over $22,000,000, it was considered prohibitory then; and in 1829 the "eastern division" to Cumberland was authorized, by national, State, municipal and private stock subscriptions. But the work had been inaugurated on 4 July 1828 by President J. Q. Adams, who struck the first spade; and it was fully opened in 1850. It is 184 miles long and 6 feet deep, 60 feet wide from Georgetown to Harper's Ferry, and 70 on an average from thence to Cumberland. It is fed from the Potomac by seven dams. The aqueduct at Georgetown over the Potomac was a very considerable engineering feat for its time; it rests on 12 masonry piers constructed by coffer-dams on rock 28 to 40 feet below the surface. At Paw Paw Bend, 27 miles east of Cumberland, the canal saves six miles by a cut-off and tunnel through the mountain, 3,118 feet long. The summit level is 613¾ feet above tidewater; the rise is accomplished by 74 locks from 6 to 10 feet lift. The whole work had cost over $9,500,000 when opened, and its total capitalized outlay had been over $15,000,000 when the bondholders foreclosed in 1890.

Erie Canal.—The best known of the New York State canals is the Erie Canal, which joins the Hudson River and Lake Erie. The original Erie Canal was the great pioneer work of engineering in America, standing as the model for canal-building for a half century. The work of opening navigation to the interior which was undertaken by the Western Inland Lock Navigation Company in 1792 did not accomplish all that was needed and early in the 19th century agitation began for something more adequate. In 1808 the legislature ordered a survey of the route between the Hudson and the Lakes for the purpose of securing information to set before President Jefferson, who a short time before had recommended that Congress appropriate surplus moneys for building canals and highways. In 1810 the legislature appointed a commission, Gouverneur Morris and De Witt Clinton being two of the members. In 1811 Robert Fulton and Robert R. Livingston were added. This commission made reports from year to year and in 1816 was ordered to make complete surveys and estimates. On 15 April 1817 construction of the Erie and Champlain canals was authorized and on 4 July 1817 the first ground was broken at Rome. On 26 Oct. 1825 the canal was formally opened from Albany to Buffalo, 363 miles. Its success was so marked that it gave rise to a veritable mania for canal-building throughout the country. There can be no doubt that it was the greatest single factor in bringing to the State and the city of New York their remarkable development and prosperity during the first half of the 19th century, giving the latter the initial impetus which has made it the chief metropolis of the Western world. The channel was 28 feet wide at bottom, 40 feet of water-surface and 4 feet deep. It had 84 locks, 90 feet long between gates and 15 feet wide, with a total lift of 689 feet. It cost $7,143,790.

The first enlargement, begun in 1836, was not finished till 1862. It shortened the canal to 350½ miles; gave a channel of 70 feet wide at water-line, 52½ or 56 feet at bottom, according to side slopes, and 7 feet deep; made 72 locks, each 110 feet long between gates and 18 feet wide, having a total lift of 654.8 feet; and cost $31,834,041. At the close of 1882, when all tolls were abolished, gross revenues to the amount of $121,461,871 had been collected on the Erie Canal; the cost of construction, improvements and maintenance had been $78,862,154, leaving a balance of $42,599,717 to its credit. The preceding decade was a period of adverse public sentiment toward the State canals and several of the lateral branches were abandoned. In 1884 there began a series of lock-lengthenings which continued for about 10 years and marked the beginning of renewed interest in canals which has endured until the present time, finding expression in two enlargements. The first of these, 1896 to 1898, which was the second enlargement of the canal, attempted a deepening to nine feet, but because of exhaustion of funds it was never completed. The third enlargement, authorized in 1903, is an improvement in more things than size; it is a rebuilding along modern lines. It was originally planned for barges of 1,000 tons, but before work was begun the size was increased to accommodate boats of two or three times that capacity. The Erie Canal has had a remarkable history. It occupies a strategic position; it connects the Lakes and the Atlantic along the only feasible canal route in the United States. It has played an important part in industrial development and regulation of commerce between the great interior and the coast, and it promises to continue exercising a mighty influence. See BARGE CANAL.

Hennepin Canal.— This is one of the few boat canals which have been dug in the United States since 1850. It was begun June 1892 and completed in 1908, at a cost of $75,000,000. It affords a short route from the upper Mississippi to Lake Michigan, extending from the Illinois River at Great Bend, about two miles from Hennepin, Ill., to Rock Island, Ill. Its entire length is 77 miles, but of this distance 27 miles are along the slack waters of the Rock River. The canal proper and its summit level feeders are 7 feet in depth and 80 feet wide. There are 37 locks, each 35 by 70 feet in size and with lifts ranging from 3 to 10 feet in height.

Illinois & Michigan Canal.— This route connects the Mississippi system with the Great Lakes, and, by the Welland Canal, with the Saint Lawrence. Its inevitability was plain by reason of the extensive use of the Chicago portage (from the Chicago River to the headwaters of the Kankakee, an affluent of the Illinois) by the Indians and trappers, it being only half a mile for boats, the shortest important portage on the continent. Chicago was one of the best trodden sites in America before white men came here. As early as 1822 Congress granted a right of way for such a canal, and in 1827 and 1854 made further grants. For some reason it hung fire for many years, though a host of surveys and estimates were made by the State and the nation. Work was prosecuted on it 1836–41, then suspended till 1845, and the canal was finally opened in April 1848. It had then cost $6,170,226. The western terminus is La Salle, at the head of steamer navigation on the Illinois River; its eastern is on the south branch of the Chicago, about five miles from its mouth in the city. The entire length is 96 miles, and the rise from La Salle to Lake Michigan is 145 feet, surmounted by 17 locks, 110 by 18; the capacity of boats is 150 tons. The original intention was to make a straight cut from Lake Michigan to the Des Plaines River, the chief branch which with the Kankakee forms the Illinois; but to save expense it was decided to use the Chicago River instead. Thence it runs to Summit on the Des Plaines 8 miles; then 42 miles to the junction with the Kankakee; thence through the Illinois Valley to La Salle. It has five navigable feeders, the Calumet, Des Plaines, Du Page, Kankakee and Fox; and five large storage basins. The summit level at Bridgeport required pumping for supply; and two steam engines, delivering 15,000 cubic feet of water per minute, were used till 1870. These were also used for many years to help draw off the sewage of Chicago, which empties for miles into the river. By supplying the canal from the river, the lake water was drawn in to fill the vacancy, and so kept the river comparatively sweet. But the system was expensive, and the canal was deepened for some years, ending 1870, to carry the sewage by its own flow to the Des Plaines, reversing the current of the river. It proved insufficient, and in 1892 the Chicago Drainage Canal (q.v.) was begun, which was finished in 1900. It is 40 miles long to Joliet, 22 feet minimum depth, and 162 to 290 feet wide at top. A scheme has been mooted for years to convert this into a huge ship canal to enable ocean-going steamers to ascend from New Orleans to Chicago, and so through the Great Lakes and to the Saint Lawrence; but it depends on the co-operation of the national government. Consult Putnam, J. W., 'The Illinois and Michigan Canal' (Chicago 1918).

James River & Kanawha Canal.— This is a line partly existent and partly on paper, but interesting as probably the oldest North American canal scheme. The idea is accredited to Governor Spotswood in 1716, when he explored the Blue Ridge; but the first active part was taken, as in all these early ventures, by Washington, who saw from his backwoods days the necessity of joining the eastern seaboard to the trans-Alleghanian territory by lines of communication. He personally explored the James River route in 1784, and induced the Virginia legislature on 5 Jan. 1785 to pass an act for improving the navigation of the James. Under this the James River Company was organized, 25 Jan. 1785, with Washington as president. No work was done, and in 1835 another company of the same name took up its task, beginning the construction of the section from Richmond to Lynchburg in 1836, and completing it near the end of 1841. The second division, from Lynchburg to Buchanan on the upper James, was begun before this was opened, and completed in 1851. In 1853 an extension of 47 miles to Covington on Jackson River was begun, but the war interrupted it, and it has never been resumed. In 1874 the cost of completing it to the Kanawha, including an improvement of the navigation of that river, was estimated at $60,000,000.

The Ohio Falls Canal.— This is a short canal, but from its location a very important one; it makes continuous navigation in one of the chief waterways of the continent. The first canal was built 1825–30, and called the Louisville & Portland. It was 1 7-10 miles long, 64 feet wide, had 8⅓ feet lift, and three locks, one at the head and two at the foot. An enlargement was begun in 1861, but interrupted by the war; in 1868 the national government included it in its river and harbor appropriation, and it was opened February 1873, having cost about $4,000,000. It runs west from in front of Louisville, Ky., to Portland; is a little over 11,000 feet long and 86½ feet wide, with a minimum depth of 6 feet assured by a dam at the falls. The water in the river varies from 6 to nearly 43 feet, and earthen parapets on the sides of the canal rise to 44 feet, based on stone walls, themselves built on the limestone rock through which the canal is cut. The upper lock has been raised, the lower two left as they were, but a branch with two locks has been added. At the head are flood-gates 46 feet 11 in. high. The upper entrance is 400 feet wide.

Among others existent or of past importance are the canal between the Chesapeake and Delaware bays, across the Delaware isthmus, built 1824–29, 13½ miles long, and supplied by pumps for 10 miles of it. An enlargement has been projected. This system has recently been acquired by the Federal government. (See SHIP CANALS). The Morris Canal, 101 miles long, built in 1830, connects the Hudson at Jersey City with the Delaware at Phillipsburg, N. J.; it is owned by the Lehigh Valley Railroad. The Delaware & Raritan, 43 miles long, built 1831–34, connects those rivers, and therefore New York and Philadelphia. The Delaware & Hudson, completed 1820, was once the great coal freight route between New York and the Pennsylvania mines; its company transformed itself into the railroad company of the same name, and has abandoned the canal. The Schuylkill Coal & Navigation Company's canal is 108 miles long. The Ohio & Erie Canal from Portsmouth, Ohio, to Cleveland, and the Wabash from Toledo, Ohio, to Evansville, Ind., were once of importance in building up these sections.

The initiative taken by New York in the construction of the great barge canal seems to have had the effect of causing a new era of canal building. Several projects have been begun and several of these have almost been completed, among these latter being the Lake Washington Canal, which connects Lake Washington, near Seattle, Wash., with Puget Sound by means of a canal nearly two miles in length, a 17-foot lock being required to lift the vessels from the waters of the Sound to the lake. The Dalles-Celilo Canal is another enterprise practically completed, which opens up the Columbia River to light draught vessels as far up stream as Priest Rapids, on the main river above Pasco, and to Lewiston, on Snake River, in Idaho. It is 8½ miles in length and climbs to a height of 82 feet above low water, the cost of building having been $5,000,000. During 1915 the Illinois legislature appropriated $5,000,000 for a 65-mile canal, 8 feet in depth, from Joliet to Utica, the canal to start from the end of the Chicago Sanitary District Canal. The Pennsylvania legislature, too, has authorized an issue of bonds for the construction of a canal from Pittsburgh to Lake Erie. According to the plans already roughly drafted this canal will put Pittsburgh into water communication with 27 States.

Bibliography.— Hepburn, 'Artificial Waterways and Commercial Development' (1909); Moulton, 'Waterways vs. Railways' (1912); Bellasis, 'River and Canal Engineering' (1913); 'The International Yearbook' (1916).

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CANANDAIGUA, N. Y., city and the county-seat of Ontario County, 29 miles southeast of Rochester, at the northern end of Canandaigua Lake, and on the New York C. and H. R. and Northern C. railroads. It is situated, on high ground, with a commanding view of the lake amid attractive scenery, Canandaigua is a popular holiday resort. The fishing and boating accommodations are excellent. The chief manufactures are those of ale, pressed brick and anti-rust tin and enameled ware. The power-house and shops of the Rochester and Eastern Interurban Electric Railway are located here. The public institutions include the Thompson Memorial Hospital, the Ontario Orphan Asylum (private), a private sanatorium, an association library, two banks and churches of six denominations. It is also the seat of Canandaigua Academy, a public high school, and of the Granger Place School for Girls, a private secondary school. The government is administered by a mayor and a board of aldermen. Municipal waterworks, a sewage system, public playground and swimming schools are modern developments. Canandaigua was settled by New Englanders in 1789, became a village in 1815 and received a city charter in 1913. The name was originally Canandarqua, an Indian word thought by some to signify «the chosen spot,» by others «the site of a former settlement.» Pop. 7,217.

CANANDAIGUA LAKE, N. Y., a body of water lying chiefly within the limits of Ontario County. It is 668 feet above the sea and 437 feet above Lake Ontario, and has an extreme length of 15 miles and an average width of one mile. Its outlet is the Clyde, a tributary of Seneca River.

CANANI, kä-nä'nē, **Giovanni Battista,** Italian anatomist: b. 1515; d. 1579. He discovered certain of the hand muscles, and was the first to observe the use of the valves in the veins.

CANAR, kä-ñär', Ecuador, a small province situated among the Andes, between the provinces of Chimborazo and Azuay; capital, Azogues. It has the Eastern Cordillera of the Andes on the eastern border, and is watered by the tributaries of Paute River. Numerous Inca remains are found there. Pop. 64,000.

CANARD, ka̤-närd', or ka̤-när', a false report; a silly rumor. The origin of this use of the term is not known. It is the French word meaning «duck,» and is thought by some to be derived from the old phrase, *Vendeur de canard à moitié*, one who half-sells a duck or cheats in such a transaction; hence a liar, a guller, etc. According to an account of wide currency in different versions, the usage arose from a story of cannibalism among a flock of ducks that ate one of their number each day until they were reduced to a single survivor, who, it was argued, had eaten all his companions. The story became common in Paris, and afterward, when any marvelous recital was heard, the listener would shrug his shoulders and exclaim, *C'est un canard!* («That's a *canard*, or duck!»).

CANARIES. See CANARY ISLANDS.

CANARIUM, a genus of plants of the order *Burseraceæ*. There are about 90 species, inhabiting tropical Asia and Africa. The gum of *C. commune*, known as Elemi, has the same properties as balsam of copaiva. The nuts are eaten in the Moluccas and Java, but are apt to bring on diarrhœa. An oil is expressed from them, used at table when fresh and burned in lamps when stale.

CANARY, a small domesticated finch (*Carduelis canaria*), closely allied to the goldfinch (q.v.), and found throughout the Canary Islands, Cape Verde and Madeira. Domestication, besides having modified the size and colors of this bird, has developed its power of song. It was introduced into Europe as a cage-bird early in the 16th century, and is now familiar in all parts of the world. Canaries in their wild state are about five inches long, and, like other finches, live mainly upon seeds, seldom eating insects. They build nests of moss and feathers in bushes and trees, often near dwellings; and their pale-blue eggs number four or five. Canaries are bought, bred and sold in large numbers in England, Scotland, Belgium and in the Hartz Mountains, where their breeding forms an important household industry. The varieties are named, to a great extent, from the localities in which they are bred. Among birds valued for their beauty rather than for their power of song are: the British crested Norwich canary, the Manchester canary, which is noted for its abnormal size, it sometimes reaching a length of eight inches. The Scotch Fancy is a slender bird with long neck, its body, trunk and tail, when in certain positions, curving into almost a half circle. The gold- and silver-spangled canaries are considered the handsomest. Their ground color is dull, spotted with gold or silver markings. The Belgian or humpback canaries are also bred for their beauty of plumage, and are remarkable by reason of the peculiar appearance they present by their broad shoulders, short neck and small head. Canaries bred for their power of song, and selling for from $1 to $75, are those of the Hartz Mountains, which vary in color from a clear yellow to a bright green. The most valuable of all varieties is the South Andreasberg bird, bred solely for their power of song. Single birds are frequently utilized for the instruction of young birds, and are known as «campaninis.» Other varieties are the cinnamon canaries and the cayennes, the brilliant red and scarlet of the latter being due to judicious feeding with red pepper. Canaries are also crossed by fanciers, with other finches; the resulting hybrids are called «mules,» and are usually from the mating of hen canaries with other cock birds, great difficulty being experienced in keeping female goldfinches, linnets, etc., on the eggs in captivity.

Canaries are easily cared for, the only essentials being cleanliness, food and water. The principal danger to the bird is a cold draught. The best food consists of canary-grass seed, hemp-seed and a certain amount of greens. Acids are to be avoided, but sugar is beneficial in small quantities. Lime is essential to its welfare and is most easily obtained in cuttle-fish bone. If their nails grow so long as to be troublesome to the bird, they should be occasionally cut with a very sharp scissors, thus running no chance of injuring the foot. Attention must also be given to the perches. These should be no thicker than a thin lead pencil, so that the birds' toes may meet around them. Consult Wallace, 'The Canary Book' (London 1893); Belts, 'The Pleasurable Art of Breeding Pet Canaries' (London 1897); Blakston, Swaysland and Miener, 'The Book of Canaries and Cage Birds' (London); Holden, 'Canaries and Cage-Birds' (New York 1883); Robson, 'Canaries, Hybrids and British Birds in Cage and Aviary' (London 1912). Consult also the weekly, *Cage-Birds* (London).

CANARY-CREEPER, or **CANARY-BIRD FLOWER,** an annual climbing plant (*Tropæolum peregrinum*), of the nasturtium family, a native of Colombia, cultivated for its showy yellow flowers.

CANARY-GRASS. See CANARY-SEED.

CANARY ISLANDS, or **CANARIES,** a cluster of islands in the Atlantic, politically forming a province and military district of Spain, but geographically considered as belonging to Africa, the most easterly being about 150 miles from Cape Nun. They are 13 in number, 7 of which are of considerable size, namely, Palma, Hierro, Gomera, Teneriffe, Grand Canary (Gran Canaria), Fuerteventura and Lanzarote. The other six are little more than mere rocks. The population numbers about 526,400, the area being about 3,216 square miles. Lanzarote and Fuerteventura lie in the northeast of the group. Hierro is the farthest southwest. Through Hierro the first meridian used to be drawn. All are rugged and mountainous, frequently presenting deep ravines and precipitous cliffs to the sea, though having also fertile valleys and verdant slopes. The principal peaks are those of Teneriffe, 12,182 feet, and La Cruz, in Palma, 7,730 feet. Fuerteventura and Lanzarote, which are nearest the African coast, are less elevated than the others, and have more strongly marked African characteristics. Evidence of volcanic action is almost everywhere present, and volcanic disturbances have taken place on some of the islands in quite modern times. The flora of the central and western islands generally resembles that of the Mediterranean region, the trees and shrubs including the oak, chestnut, pine, cedar, laurel, heather, etc.; but there are (particularly on the eastern islands) plants that belong to the African region, such as the dragon-tree and euphorbias. Among the fauna may be mentioned the canary, the red partridge, and several kinds of lizards; there are no snakes. Goats and camels are the chief domestic animals. The islands are deficient in moisture and severe droughts sometimes occur; tornadoes also are not infrequent. The climate is hot on the low grounds, temperate higher up, and generally healthy. The soil where suited for cultivation readily produces all kinds of grain, fruits and vegetables in abundance, three and even four crops being raised yearly; some of the islands furnish good wine, especially Teneriffe and Palma. The Canaries constitute a valuable possession of Spain and they serve as a winter resort for invalids from colder regions. This has led to the erection of hotels specially intended for visitors, to the making or improvements of roads and to the providing of attractions of various kinds, including golf-courses, lawn-tennis grounds, etc. There are several places of worship for English-speaking visitors. The exports at present consist chiefly of bananas, tomatoes, onions and potatoes, shipped in great quantities to London and Liverpool, cochineal, sugar, wine, etc. The imports chiefly consist of textiles and other manufactured goods, cereals, coals, etc. Peaches, oranges, lemons, figs and other fruits are cultivated. Teneriffe and Grand Canary are the two chief islands. Santa Cruz, the capital of the islands, is a port on the northeast coast of the former, and on the western coast of the same island is Orotava, a favorite resort of foreign visitors. Las Palmas, on the northeast coast of Grand Canary, is a more important place, with its new harbor, Puerto de la Luz, between three and four miles distant, protected by a breakwater. The city is rapidly extending, its streets have been improved and lighted by electricity. In 1917 it had about 43,000 inhabitants. Numerous steamers engaged in the trade between Europe and Africa call here, and also at Santa Cruz. Wireless telegraphic stations, one of 860 miles range, carry out the service with Spain and another of 250 miles range the service with ship and shore traffic.

Historical Outlines.—The half-fabulous «Fortunate Isles,» as the Canary Islands were called in the classical ages, were undoubtedly known to the Semitic merchant-adventurers from the south-southeast Mediterranean coasts (including the Carthaginians) long before the Roman conquests extended to Spain. But it is possible that, as Mr. Royale Tyler suggests, the Carthaginians may have kept the secret of their whereabouts for fear that others might share with them such advantages as the astute traders of those days were anxious to keep to themselves. Contact with the outside world appears to have been interrupted for centuries. Finally, the Arabs «discovered» the Canaries in the 13th century; the Portuguese and Majorcans visited them in the 14th; and in the early years of the 15th a Norman adventurer, Jean de Béthencourt, established himself at Fuerteventura and founded his capital in a village that still exists under the name of Betancuria (more correctly, Bethencuria), on the western side of that island. The King of Castile was his protector, and toward the end of the 15th century Ferdinand and Isabella took possession of the islands. At that time the Canaries were inhabited by people of different races, some of whom were Semites, as we have said; but the bulk of the population was formed by a people called the Guanches who had been in possession of the islands for ages. The blood of the Guanches still flows in the veins of many of the inhabitants; and even to-day, in Gomera and Teneriffe especially, the old race appears to have maintained itself almost without admixture.

CANARY-SEED, the seed of a plant (*Phalaris canariensis*), belonging to the order of *Graminaceæ*, cultivated for its seed, which is used principally as food for birds. In its early growth it is scarcely distinguishable from oats or wheat. With good cultivation it attains a height of three or four feet, and terminates in egg-shaped heads or ears, each containing upward of 100 seeds. The straw is of little value, either as fodder or litter, but the ears, especially when mixed with other kinds of chaff, are good food for horses. It requires a deep adhesive soil, and its produce per acre is about the same in quantity as wheat. It is a native of the Canary Islands, but is successfully cultivated elsewhere.

CANARY WINE, a wine that comes from the Canary Islands, chiefly from the island of Teneriffe. It is not unlike Madeira, but the name is properly applied only to the Bidogne wine.

CANARY-WOOD, the light orange-colored wood of *Phœbe indica* and *P. canariensis,* trees of the laurel family of the Azores and Madeira, so called because it was brought originally from the Canaries. It is also called Madeira mahogany.

CANASTER, or **KANASTER,** originally the rush-basket in which South American tobacco was packed and exported, and hence applied to a kind of tobacco consisting of the leaves coarsely broken for smoking.

CANASTOTA, N. Y., village in Madison County, on the Erie Canal, and on the New York Central, the West Shore and the Lehigh Valley railroads, 21 miles east of Syracuse. It is the centre of an agricultural district and manufactures agricultural implements, gasoline engines, boats, canned goods, cut glass, etc. It has two banks, public library, churches, high school, hospital and two grammar schools. Canastota was settled about 1806 and was first incorporated in 1835. The government is administered by a president, elected annually, and a board of trustees. Seneca turnpike, built in 1790 and now a State road, runs along the southern boundary of Canastota. Pop. (1910) 3,247.

CANBERRA, the new Federal capital of the Commonwealth of Australia, situated in lat. 35° 15′ S. and long. 149° 15′ E. on a plateau about 2,000 feet above sea-level in the Yass Canberra district, New South Wales, 70 miles distant from the eastern coast line of Australia. The constitution of 1900 provided for a new capital, and after nearly 10 years' search and deliberation the present site was chosen. The territory is 900 square miles in area, and includes a spot of two square miles at Jervis Bay for the construction of a port and a naval college. In 1911 the Australian government offered $15,000 in three prizes, for the best plans submitted, the competition being open to all architects of the world. A serious difference of opinion between the Minister for Home Affairs and British architects caused all the best of the latter to withdraw from the competition. On 23 May 1912 it was announced that the first prize, $8,750, had been awarded to an American architect, Mr. Walter Burley Griffin of Chicago. The second prize ($3,750) went to M. Eliel Saarinen, of Helsingfors, Finland, and the third to Alfred Agache, of Paris. From these three plans the work of designing the future city was begun. The population contemplated for the capital was fixed at 25,000, and a period of eight years in four stages was estimated for the completion of the preliminary works, at a cost of $10,000,000. According to Mr. Griffin's plan the city will be divided by three large sheets of water, with parks and boulevards; a capitol of 600 feet frontage and 200 feet depth; accommodation for all the great departments of state; courts of justice, mint, art gallery, museum, churches, a university, post-office, hospital, stadium, gas-works, etc. A large reproduction of the winning design appeared in the London *Times* of 24 May 1913.

CANBY, Edward Richard Sprigg, American army officer: b. Kentucky 1817; d. 11 April 1873. He was graduated at West Point in 1839; served in the Mexican War, 1846–48; commanded the United States troops in New York during the draft riots of 1863; succeeded General Banks in the command of the army in Louisiana, 1864; became brigadier-general, United States army, and major-general of volunteers, 1866. After the war special duties were assigned to him, and in 1869 he took command of the department of the Columbia. He was treacherously shot by an Indian chief, while negotiating for the removal of the Modocs from northern California, in the «Lava Beds.»

CANBY, William Marriott, American botanist: b. Philadelphia, Pa., 1831; d. 1904. He was educated privately, and though a business man, devoted much time to the study of botany. He gathered a fine herbarium of over 30,000 species of plants, which is now owned by the New York College of Pharmacy. A smaller collection was brought together for the Delaware Society of Natural History. He was one of the botanists attached to the Northern Pacific Transcontinental Survey.

CANCALE, kăn'cal', France, fishing port of Ille-et-Vilaine department, on the Bay of Mont Saint-Michel, 10 miles east of Saint-Malo. Oyster culture and shipbuilding are busy industries, and it is a popular seaside resort. Pop. 8,000.

CAN-CAN, a dance, something of the nature of a quadrille, but accompanied by violent leaps and indecorous contortions of the body originated by the demimonde of Paris, and resembling the old Bacchic dances. The earlier and usual meaning of the word in French is noise, racket, scandal and is derived, oddly enough, from the Latin conjunction *quamquam,* «although,»— a great squabble having arisen in the French mediæval law schools as to the pronunciation of this word.

CANCELLARIA, a genus of Gastropods belonging to the family *cancellariidæ,* in which the shell is turbinate, scabrous and generally reticulated, the spire and aperture nearly equal and the body ventricose. Tate in 1875 estimated the known recent species at 71, and the fossil ones, at 60, the latter from the Upper Chalk till now.

CANCELLATION, a method of abbreviating certain arithmetical and algebraic operations. When the product of several numbers is to be divided by another such product, any factors common to both products may be left out, or «canceled.» If divisor and dividend do not appear *in extenso* as products, the process of cancellation may yet be applied if common factors exist and can be detected. The work is substantially the same as that of reducing fractions to their lowest terms.

CANCER, Luis, early Spanish-American missionary: b. Barbastro, near Saragossa; d. Florida 1549. After missionary labors in Dominica and Haiti, he was very successful with the antagonized Indians of the mainland and supported their cause in an ecclesiastical assembly at Mexico in 1546. He was killed by Florida Indians 26 June 1549.

CANCER. Nature of Cancer.— A tumor is a growth of abnormal size and situation, composed of cells of the body. Some tumors are not dangerous to life, because they do not increase after they attain a certain size; others, and these are *cancers,* have no limit to their growth, and destroy life by extending into healthy tissue or by interfering with digestion or some other important vital function. While a cancer is a particular sort of tumor, there are also many varieties of cancer; and these varieties are classified according to the tissue from which the growth originates. If the cancer begin in the skin or epidermis, it is called an *epithelioma;* if it begin in a gland, it is called a *carcinoma;* if it begin in muscle, fibrous tissue, tendon or bone, it is called a *sarcoma.* These kinds of cancer grow progressively and are fatal if not promptly removed.

Sarcoma of arm

In the beginning a cancer is composed of a few microscopic cells, much smaller than the point of a pin. Depending upon the type, it may grow in a few months to the size of a grapefruit, or may require years to reach the size of a pea. When it first begins to grow there are no symptoms — no pain and no bleeding; but later, when the cancer presses on the nerves, pain results. Bleeding begins only when the cancer ulcerates. Any other symptoms to which a cancer may give rise are due solely to its interference with some normal function of the body. A cancer looks like a lump of tissue. It has no roots, as is popularly believed, but it may grow out through the vessels of the body to distant parts.

Cancer is not a new disease but one which has been recognized since earliest times. It is mentioned by the Egyptians in the Papyrus Ebers, and by the Hindus in their medical writings, both of which probably date back to about 2000 B.C.

Occurrence of Cancer.— While cancer occurs not only in man but in all warm-blooded animals, it is not equally frequent at all ages.

Certain types of cancer may be found in a new-born infant, in other words, are congenital; but these are very rare. The usual rule is that cancer begins to appear at the age of 35, and increases rapidly in frequency until the age of 65 — a little earlier in women, a little later in men. After 75, the rate of occurrence of cancer decreases very rapidly, until it practically disappears at 90. The same frequency distribution according to age is seen also in mice, rats, dogs, cats, etc.; that is, the disease appears only in older animals, but is less often seen in the very old.

Sex Variations.— Sex has some influence on the rate of occurrence of cancer; for example, between the ages of 35 and 45, men show the disease less often, practically only one-third as often as women; between the ages of 55 and 65 the frequency in men is about 65 per cent of that in women of corresponding age; while in old age, men have more cancer than women. This is due to the fact that in women a great many cancers occur in the breast and in the womb at about the beginning of the change of life, that is, from 45 to 50 years of age. On the other hand, cancers of the lip and tongue attack men only, practically; and these, with cancer of the skin, appear late in life. Similar variations in the occurrence of cancer are noted also in the different organs of the body; for example, the more frequent site for cancer is either the stomach or the liver. Thus, while in 1913, in the United States, 30,205 people died of cancer of the stomach or of the liver, only 2,633 died of cancer of the skin, and 3,007 of cancer of the tongue and mouth.

Race Variations.— The differences noted in the occurrence of cancer in organs are also noted in the occurrence of cancer in different races; for example, the negro race is attacked by cancer much less frequently than the white race, and cancer seems to be more frequent in people of the northern European states than it does in those living in the tropics or in South America, although the population of South America is much the same as that of Spain. There is, also, a difference in the organ distribution in different countries. In England and Wales, out of 100,000 women, 18.6 individuals will have cancer of the breast, while in Japan, only 1.8 women out of 100,000 will suffer from the disease. The occurrence of cancer of the skin in the negro race in the State of Maryland is only half that in the white population.

Epithelioma of ear

Occupation also plays a still but little understood rôle; thus in England from 1890 to 1892, the death rate per 100,000 from cancer was 67 in clergymen and 265 in chimney sweeps. The irritation resulting from the soot may explain this difference.

Increase of Cancer.—There is a widespread opinion that cancer is increasing rapidly in frequency of occurrence. This question has been subjected to elaborate statistical analysis by Hoffman in a volume on 'The Mortality of Cancer Throughout the World.' Hoffman comes to the conclusion that there is a gradual increase in the number of cases of cancer occurring in most of the countries of the world, but that this increase tends to reach a certain maximum and not to pass that point. This maximum has already been reached in Switzerland, where the cancer death rate is now 124 per 100,000, while in the United States it is only 74 per 100,000. There are, however, many authorities who consider that this increase in cancer is due not to an absolute increase in the number of persons with cancer, but to an increase in reported cases; in other words, that improvements in diagnosis and in our understanding of the nature of the disease and the increased accuracy of statistics have resulted in an increase in the number of cases of cancer which are reported. The matter cannot be considered as finally settled, however; and only greatly improved statistical reports from different countries can throw any light upon the problem.

Heredity.— The question of heredity in cancer has long occupied the attention both of statisticians and of workers with experimental cancers in animals. While there is no doubt that an individual family may show a large number of cases of cancer for one or two generations, this is by no means a proof that the disease itself is hereditary. It is not even a proof that a liability to the disease is hereditary. If we realize that out of every 100,000 people living in the United States, 80 will die from cancer, it is easy to see that, as age increases and the frequency of cancer becomes greater (so that between the ages of 45 and 65 one woman in 6 and one man in 12 will die from the disease) the occurrence of several cases in a family, especially if it be long lived, is not astonishing. It is evident that if cancer occur so frequently, some families are bound to have a larger number of cases than others, merely by chance. This point is illustrated in the «cancer villages» which will be discussed in the next paragraph. The problem of heredity in cancer has interested the life insurance companies, also, because if cancer be hereditary, it is very important that no one in whose family cancer has occurred shall be accepted by the companies. But a careful analysis of a large number of persons insured shows that the liability of death from cancer is no greater because that disease has occurred in one's family than it is if no cancer death has been recorded; so that the insurance companies do not regard a history of cancer in the ancestry as any evidence that cancer will occur in the descendants.

It has been shown, however, by breeding mice of cancerous ancestry, that is, by selecting both father and mother from a highly cancerous strain, that the amount of cancer occurring in the descendants after many generations of such selected breeding, is apt to be about twice as much as occurs in the stock in which no special selection was made. Such a concentration of cancer heredity in man is quite impossible, as the stock would die out long before the 8 or 10 cancerous generations could be produced.

Contagion in Cancer.— It is a popular superstition that cancer is contagious, and that it is very dangerous to nurse a person with an ulcerating cancer; but there is not the slightest foundation for this belief. There is no recorded evidence of a case in which cancer has been transferred from one person to another or in which a surgeon has contracted the disease during an operation on a cancerous patient. If cancer were a germ disease, it would probably be very easily transmitted in this way; but there is no evidence that a germ has anything to do with the development of the tumor; and the only way in which the disease can be transferred is by direct grafting of a piece of the growth from a cancer patient to a healthy person. It is very difficult even to graft a cancer from one mouse to another. Often hundreds of animals are inoculated in order that one or two cancers may be grown. Animals bearing cancer and healthy animals have been kept together in large numbers for long periods, and not the slightest evidence of any transfer has been shown.

It has been popularly supposed that cancer is very abundant in certain districts or villages or houses, and that this fact pointed to the contagiousness of the disease; but when the population of these districts is studied, it is usually found that all the young people have gone to the neighboring large towns or cities, leaving only those whose age is such that they are especially liable to cancer. Consequently, the number of cases seems very large and the percentage is increased for that particular locality; but if the cancer incidence is considered in conjunction with the age of the population, it will be found that no greater number of cases has occurred, for example, between the ages of 45 and 50, than has occurred in the general population elsewhere in the country within the same age limits. It follows that «cancer villages» do not exist, although old-age villages do.

Human cancer is not derived from animal cancer, for it has been shown that it is impossible to transplant, even with the greatest care, a tumor from a mouse to a rat or a tumor from a rat to a mouse; in other words, cancer of one animal will not grow in any other animal except it be one of the same species; that is, no animal cancer can be transplanted to a human being and remain alive and grow.

The theory of the origin of cancer from the so-called cancers of vegetables, which are really not cancers but only inflammations, seems too foolish to have any wide credence; but occasionally the newspapers take up some such wild story and people are led to believe that there may be something in it. It is, however, not true.

Cause of Cancer.— The cause of cancer is not known, though there are two popular superstitions regarding it. One is, that cancer may be produced by a blow; and the other, that cancer is due to a germ. To uphold either of these there is not the slightest evidence. A large number of cases in which it was claimed that a blow had caused the growth of the cancer have been investigated, and it has been found that the disease existed before the blow was received. And when we compare the large numbers of people who in their lifetime have received blows in various portions of their bodies, with the small numbers relatively who have developed cancers, it is evident that there can be no relationship between the blow and the beginning of the tumor. It is true that a blow may stimulate a cancer which is already existing, but usually on investigation of such cases it will be found that the growth had reached a considerable size before the injury occurred. The same thing is true of the growth of cancer in a broken bone; the presence of the tumor in the bone makes it liable to break, and often the fracture is the first evidence of the tumor. But the fracture did not cause the tumor, even though it may appear to have grown after the break occurred or was not discovered until after the injury.

The reasons for believing that bacteria have nothing to do with cancer are based upon experimental work on animals. If a cancer is transplanted from one animal to another of the same species, it will grow and ultimately kill the second animal; some cancers are so very virulent that they will, when properly transplanted, grow in every mouse in which they are implanted and cause the ultimate death of the host. But if some of this cancer tissue is crushed or frozen so that all the cells present are broken up, it will not produce a tumor when grafted on to another animal. Now we know that bacteria will live in liquid air which is about 400° F, below freezing, and that they are not killed merely by being crushed; and for these very good reasons we believe that cancer is not produced by bacteria.

While we do not know the cause of cancer, we do know the conditions under which it is liable to arise, and these are any chronic inflammation or ulceration of the skin or of any organ of the body. If, for instance, the skin is burned, and the burn remains for a long time, there is always risk that a cancer may develop in the site. The burns due to X-rays are very chronic; and cancers frequently develop in them. Cancers frequently follow irritation of the lip, tongue or cheek, by smoking or by a rough tooth or an ill-fitting plate.

This relationship between chronic irritation and cancer is well shown by the fact that women of the white race very rarely suffer from cancer of the cheek, while in Ceylon and the Philippine Islands where women chew a highly irritating substance known as the betel-nut, and keep the chewed mass in the cheek over night, they very frequently have cancer arising on the inside of the mouth. Chronic ulcer of the stomach in persons over 40 is another condition which has the same relationship to cancer, for it has been shown that most of the cases of cancer of the stomach arise in one of these ulcers. Chronic ulceration or irritation of the intestine, also, is a cause of the beginning of cancer; and cancers of the womb often result from tears or injuries following childbirth.

Cancer of the breast occasionally begins in lumps which are the seat of chronic inflammation, so that it is well in case a woman has a lump in the breast to have it carefully examined by a physician every six months or so in order to be sure that a cancer is not beginning.

Chronic irritation, therefore, is the only cause for cancer which we know of, and yet it is curious that not everyone who has chronic irritation develops cancer. There is some peculiar personal quality in the tissue which is necessary before a cancer will develop. An example of this is the fact that leg ulcers which are so very common among old people almost never give rise to cancer, although ulcer of the stomach so frequently does. There is, therefore, something besides the ulceration and the chronic irritation which makes the cancer start.

Cure of Cancer.— The only generally successful cure for cancer is its removal as early as possible by surgical means. The use of the knife is preferred to caustics or cautery because it permits of a cleaner cut and more rapid healing. Of course, the knife is the only possibility for deep internal cancers involving the stomach or intestines; but occasionally cancers of the skin are treated by caustic with fair results. It is, however, better to have the cancer cut out clean, as the scar is then much less marked and the healing is more rapid. It is, also a satisfaction for the patient to know that all the cancer is out of the body, instead of having it burned out by some slow caustic. A certain number of cancers of the face, and especially small early cancers in other sites, can occasionally be cured by either radium or X-ray, but as yet we have no published statistics to show what proportion of cases can be permanently cured by either of these agents; the number of cures reported after some 10 years of use of both these is exceedingly small, and the results are not nearly so good as those which follow surgical removal of the entire tumor. For it must be remembered that cancer is not a blood disease and that when it begins it is no larger than a pin-point, so that if we could make a diagnosis and cut it out in time, every cancer would be curable. The difficulty is to make a diagnosis and as the symptoms of cancer are obscure and often are entirely absent, it is impossible for a physician to learn of the beginning of the disease in time to cut it all out. With every improvement in diagnosis of cancer, the possibility of curing the disease is increased.

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CANCER, in astronomy, fourth sign in the zodiac (q.v.) marked thus ♋. The sun enters this sign on or about the 21st of June. He is at his greatest northern declination on entering the sign, and the point which he reaches is called the summer solstice, because he appears for the moment to stop in his progress northward and then to turn south again. The sun is then 23½° north of the equator, and a small circle of the sphere parallel to the equator at 23½° distant from it is called the Tropic of Cancer. The sun leaves this sign about the 22d of July. The constellation Cancer is no longer in the sign of Cancer. At present it occupies the place of the sign Leo. The constellation Cancer contains within it the cluster of Praesepe or the Manger. This lies between two stars of the fourth magnitude, the Aselli or Asses, whose disappearance, according to the ancients, presaged rain. The arrangement of the stars is in the triple or quadruple system ζ Cancri. Two close stars of the fifth and sixth magnitudes which revolve about each other during 60 years; and a third part which has a retrograde motion of longer period, which is still unknown and variable, form the constellation. It is probable that the third component is a satellite of a larger body, and that the other two stars also revolve about this larger unknown.

CANCER-ROOT, or **BEECH-DROPS,** a branched parasitic plant (*Leptamnium virginianum*), of the family *Orobanchaceæ,* with brownish scaly leaves, indigenous in eastern North America, growing almost exclusively on the roots of the beech tree. The whole plant is powerfully astringent, and the root of a brownish color, spongy and of a very nauseous bitter taste. It was once popularly believed to be a cure for cancer. Other plants of the same family are also called cancer-root.

CANCRIN, kăn-krēn', **Georg,** COUNT, Russian general, statesman and financier: b. Hanau, Prussia, 8 Dec. 1774; d. Saint Petersburg, 22 Sept. 1845. He studied at Giessen and Marburg. In 1812 he was commissary-general of the Russian forces, and in 1814 accompanied Tsar Alexander I to Paris; was Minister of Finance from 1823 to 1844; and wrote on military and economic subjects, his most noted works being ‹Military Economy in Peace and War›; ‹The Economy of Human Societies› (1845).

CANCRUM ORIS, or **NOMA,** gangrene of the cheek, due to bacterial infection and mostly occurring in sickly children, especially those with scarlet fever or measles. The immediate cause is infection from a fusiform bacillus and the spirillum of Vincent, associated with other pus-producing microorganisms. It begins as a red spot on the cheek or at the angle of the mouth, spreads rapidly, and soon eats away the whole cheek, even the bone. There is fever, and death usually results in 75 to 80 per cent of the cases. As soon as the disease is recognized it should be freely cauterized and the parts kept bathed in antiseptic solutions.

CANDACE, kăn'dạ-sē, a name apparently common to the warrior queens of Ethiopia (Upper Nubia), between the Nile and the Atbara, in the later period of the kingdom of Meröe. The most distinguished of them invaded Egypt 22 B.C., was defeated by the Romans and obliged to sue for peace, which she obtained with a remission of the tribute imposed on her by Petronius. One of her successors is mentioned in Acts viii, 27; her high treasurer was baptized by Philip the Deacon on the road to Gaza.

CANDAHAR. See KANDAHAR.

CANDAULES, kăn-dô'lēz, king of Lydia, who lost his throne and life through his besotted admiration of the beauty of the person of his Queen in 718 B.C. See GYGES.

CANDEE, Helen Churchill, American writer: b. New York 1868. She was educated at various private schools in New Haven and

Norwalk, Conn. Has published ‘An Oklahoma Romance’ (1902); ‘Styles and Periods in Furniture and Decoration’ (1908); ‘The Tapestry Book’ (1912); ‘Jacobean Furniture’ (1916). Is also a specialist and lecturer on fine antiques, tapestries and decorations.

CANDEILLE, kän'dī'ę, **Amélie Julie**, French actress, singer and composer: b. Paris, 31 July 1767; d. there, 4 Feb. 1834. At a very early age she began to take leading parts in classical opera. Later she abandoned opera and made her appearance at the Comedie Française in 1785, in ‘Andromaque,’ ‘Bajazet’ and ‘Tancrède.’ In 1790, she composed both libretto and music of ‘Catherine ou la belle fermière,’ a very popular operetta in three acts, in which she took the leading part and accompanied herself on the harp and on the piano. She also made several tours through the Continent, wrote novels and several other operettas.

CANDEISH. See Khandesh.

CANDELABRUM, a word originally signifying candlestick, but usually denoting a support for a lamp or lamps among the Romans. The candelabra were of considerable size and often intended to stand upon the ground. They were made of wood, bronze, silver or marble, and were often elaborately and beautifully adorned. Sometimes they had shafts in the shape of columns, which could be shortened or drawn out; sometimes the luxuriant acanthus formed a part of them; sometimes they represented trunks of trees entwined with ivy and flowers, and terminated by vases or bell-flowers, at the top, for the reception of the lamps; and not infrequently the lamps were supported by figures. In ancient times Tarentum and Ægina were famous for their elegant candelabra, and Corinth also manufactured them. The Etruscan candelabra of bronze were celebrated. Examples may be found in the plates of the ‘Museo Gregoriano’ or in the works of Overbeck, ‘Pompeii in seinen Gebäuden, Alterthümern und Kunstwerken’ (4th ed., Leipzig 1884), and Mankelsy, ‘Pompeii: Its Life and Art’ (New York 1902).

CANDIA. See Crete.

CANDIA, or MEGALOKASTRON, Crete, a fortified seaport and capital of the island, situated on the north coast, 65 miles east of Canea; lat. 35° 20' N. and long. 25° 9' E. Its harbor admits only vessels of small draught. The governor and the Greek archbishop reside here. Soap is manufactured and exported. The fortifications of the city date from the time of the Venetian occupation, and in 1669, after a prolonged siege, it submitted to the Turks. These fortifications have been much demolished by frequent earthquakes. Pop. estimated at 20,000.

CANDIDA. George Bernard Shaw's play ‘Candida’ belongs to that early group of the author's plays that followed hard upon the close of his novel-writing period. Written in 1894 for Richard Mansfield, who had that year produced ‘Arms and the Man,’ it had its first production on any stage in 1897 when the Independent Theatre Company offered it in Aberdeen and on tour, with Janet Achurch in the title rôle and Charles Charrington in the part of the Rev. James Mavor Morell. It was printed the following year as the second play in the volume of “pleasant” plays in the ‘Plays Pleasant and Unpleasant’ series. The theme of love, marriage and the artist had been treated by Shaw in his novel, ‘Love Among the Artists.’ It is returned to as a minor theme in ‘The Doctor's Dilemma.’ In ‘Candida’ it is handled in a spirit of combined disillusion and reverence that raises the play to first rank as a work of art and as a psychological document. Into the contented household of the Rev. James Mavor Morell and his wife, Candida, comes the poet, Eugene Marchbanks. The action that follows is not so much a development of the triangle theme, as the testing of the marriage compact of Morell and Candida before the acute perceptions of the poet. Marchbanks' temporary error in thinking he is in love with Candida but raises her to a greater clarity of insight; happily too it gives the masterful Morell a quarter of an hour of keen self-distrust. But there is no real struggle between Morell and Marchbanks. Each man has what he most desires and most needs. In Marchbanks, who all through is too much “aware” to be really in love, the author is revealing the lonely soul of the poet, as in Candida and Morell he is uncovering the secret places in the marriage bond. “One of the noblest, if not the noblest, of modern plays,” Chesterton calls ‘Candida.’ This nobility appertains not only to the theme, but as well to the manner in which the play is written. In its freedom from “gallant, wicked and poetic attitudes,” in its lofty idealism as well as in its searching of human weaknesses it is a work of genius. Unlike the greater number of Shaw's plays ‘Candida’ is a true theatre-piece. Against all the dramatic anarchy of his discursive plays it is Shaw's indubitable warrant as a great dramatist. The stage history of the play has been distinguished. Finally produced by Mansfield in 1903, it was the same year given notable productions in Dresden and by Arnold Daly in New York. The following year it was a part of the Court Theatre repertory of the Vedrenne Barker management in London. It was given in French in Brussels in 1907 and in Paris in 1908. In recent years it has occupied a leading place in the repertories of “new” theatres. Consult Henderson, Archibald, ‘George Bernard Shaw: his Life and Works’ (London 1911); Chesterton, G. K., ‘George Bernard Shaw’ (ib. 1909); Burton, Richard, ‘George Bernard Shaw: the Man and the Mask’ (New York 1916); Hamon, Augustin, ‘Le Molière du XX^e siècle: Bernard Shaw’ (Paris 1913); ‘The Technique of Bernard Shaw's Plays,’ translated by F. Maurice (London 1912).

Thomas H. Dickinson.

CANDIDATE, an applicant for an office, from the Latin *candidatus*, “white-robed,” because, among the Romans, a man who solicited a public office appeared in a white garment — *toga candida* — and wore this during his candidature, which lasted for two years. In the first year the candidates delivered speeches to the people, or had them delivered by others. After this year they requested the magistrate to enter their names on the list of candidates for the office sought for. Before this was done the previous life of the candidate was subjected to a scrutiny in the Senate, after the prætor or consul had received his name. If the Senate accepted him he was permitted to offer himself on the day of election as a candidate. The formula by which permission was granted was «*Rationem habebo, renuntiabo*»; if he was not accepted he received the answer, «*Rationem non habebo; non renuntiabo.*» The tribunes often opposed a candidate who had been accepted by the Senate. The morals of the aspirants, in the purer ages of the republic, were always severely examined. In the later period of the republic, nobody could obtain an office if he was not present and if he had not offered himself on three market days. On these days the candidates tried to insinuate themselves into the favor of the people. They went from house to house (*ambitio*, whence the word ambition), shook hands with everybody whom they met (*prensatio*), addressed each one by his name, for which purpose they generally had a nomenclator with them, who whispered the names of those whom they met into their ear. Cicero, therefore, calls the candidates *natio officiosissima.* They placed themselves on market days in elevated places in order to be seen. On the day of election they did the same. Favorites of the people accompanied them (*deductoes*); some of their suite (*divisores*) distributed money among the people, which, though prohibited, was done publicly. *Interpretes* were employed to bargain with the people, and the money was deposited in the hands of *sequestres.* Sometimes a number of candidates united into parties (*coitiones*), in order to defeat the endeavors of the others. At last the grounds on which each candidate rested his claims to the office were read, and the «tribes» delivered their votes. The successful candidate then sacrificed to the gods in the capitol. To oppose a candidate was called *ei refragari;* to support him, *suffragari*, or *suffragatores esse.* In the early Church newly-baptized Christians were called candidates, on account of the white robes worn by them for a certain period after celebrating the rite. The word «candidate» is also used by Protestants to designate a theologian who, having finished his studies at a university, is waiting for an appointment in the Church. At present it means, in English-speaking countries, an applicant for any office whatever. (See CONVENTION, POLITICAL; CORRUPT PRACTICES ACT). Consult the treatise known as ‘Quinti Ciceronis de Petitione Consulatus ad Marcum Tullium Fratrem’ (printed with Cicero's letters); Greenidge, ‘Roman Public Life’ (London 1901).

CANDIDE, OR OPTIMISM (‘Candide, ou l'Optimisme’), kän′dēd, oo lŏp′te′mēs′m′, is one of the most characteristic works of Voltaire. It is the longest and the best known of the ‘Philosophic Tales’ (‘Contes Philosophiques’), in which he let his incomparably nimble intelligence play over all questions of human interest,— politics, religion, morals. The story of the remarkable adventures of Candide and his tutor, Pangloss, in search of his beloved cousin, Cunégondi, is merely the thread on which are strung the flashing gems of his wit, his satire and his irony. In substance it is a pitiless attack on the easy optimism of «Whatever is, is right.» Earlier Voltaire had shown decided leanings toward such a view. He had translated Pope's ‘Essay on Man,’ and in another philosophic tale, ‘Zadig,’ in 1747, he had, though with some mental reservations, apparently «justified the ways of Providence to man.» But his optimism, such as it was, was shattered by the Lisbon earthquake, and in Candide, in 1752, he disposed the wanderings of his personages so that they are witnesses not only of its horrors but of a thousand others. The endless panorama of human sufferings and meanness is unrolled before us,— plague, pestilence and famine, war, lust, greed, injustice, cruelty, disease. Pangloss, academic champion of optimism, long maintains in the face of each new disaster, that, after all, this is the best of all possible worlds. But even he is finally reduced to silence. Cunégondi, when found, is a mere wreck, diseased in body and soured in temper. Candide buys a little plot of ground and installs himself and his companions in a modest cottage. Life is a sorry snarl. Philosophy is powerless to untangle it. «To work without philosophizing is the only way of making life tolerable,» is Candide's conclusion. And to every attempt of the incorrigible Pangloss to discuss «cause and effect» and other high problems he opposes the famous final word of experience and common sense; «*Il faut cultiver notre jardin*»—«We must attend to our hoeing.»

ARTHUR G. CANFIELD.

CANDLE, a solid cylindrical rod composed of beeswax, tallow, paraffine or some other fatty substance, with a wick running longitudinally through its centre, designed for slow combustion with illumination. The wick is generally composed of a few threads of cotton yarn lightly twisted or plaited; but formerly, in home-made candles, dried rushes (*Juncus effusus*) were employed for this purpose. The process of making rushlights is described at length by the Rev. Gilbert White in his well-known ‘History of Selborne.’

Candles are mentioned in several places in the Bible, but no direct evidence is given as to their form or of what they were made. There seems to be a distinction, however, between candles and lamps,— the latter specifically calling for oil, while the candle is spoken of as being lighted and placed on a candlestick.

Considerable modern improvements have been made in the manufacture of candles. One of the most important of these consists in not employing the whole of the fatty or oily substances, but in decomposing them, and then using only the stearin or stearic acid of the former, and the palmitine of the latter class of substances. The animal fats are combinations of glycerine and fatty acids, principally stearic and palmitic, both solids, and oleic acid, which is liquid. If the latter be in excess, the fat will be a liquid and constitute an oil; if, on the contrary, the solid acids predominate, we shall have a more or less concrete fat, such as the tallow of the ruminants and lard of the hog. Stearic acid now constitutes the principal raw material for the manufacture of candles. The chief chemical agents employed to obtain the stearin are caustic lime, which, setting free the glycerine, produces stearate, margarate and oleate of lime, in the form of a solid soap; and dilute sulphuric acid by which this solid soap, after being reduced to powder, is effectually freed of its lime. By means of a subsequent bleaching process cakes of a perfectly white color, free from impurities, and fit for the manufacture of candles, are obtained.

Candles are commonly made by dipping, molding or rolling. The former is the older method, and consists in arranging in a frame a number of wicks of the proper length and thickness, and dipping them a number of times successively in a tank of melted tallow or other fatty composition, with intervals for the incipient forms to cool and harden. These dippings are repeated until the candles have assumed the requisite thickness and weight.

Molded candles, as their name implies, are formed in molds. These are generally made of pewter, or an alloy of 20 parts of tin and 10 of lead, though glass has also been introduced. They are hollow cylinders of the length of the candle, and open at both ends, but provided at the upper end with a conical cap, in which there is a hole for the wick. A number of these molds are inserted in a wooden frame or trough with their heads downward; the wick is then drawn in through the top hole by means of a wire, and kept stretched and in the centre by a peculiar arrangement. The molds thus prepared are filled by running melted tallow of the proper temperature from a boiler into the trough. The candles remain in the molds for about 24 hours, but, as they improve by keeping, generally remain in the storehouse for a few months before they are exposed for sale.

The rolling of candles is confined principally to those made of wax. Although the bleaching of wax was described by Pliny, the use of this material for the manufacture of candles dates back only to the beginning of the 4th century. From its tenacity, and the contraction which it undergoes in cooling, wax cannot be formed into candles by melting it and then running it into molds. Instead, wicks, properly cut and twisted, are suspended by a ring over a basin of liquid wax, which is poured on the tops of the wicks, and, gradually adhering, covers them. Or the wicks may be immersed, as in the case of tallow «dips.» When a sufficient thickness is obtained, the candles, while hot, are placed on a smooth table kept constantly wet, and rolled upon it by means of a flat piece of wood. In this way they assume a perfectly cylindrical form. Machines have been constructed, however, for the manufacture of such products. The large wax candles used in Roman Catholic churches are merely plates of wax bent round a wick and then rolled.

For preparing wax tapers, the wick is wound around a drum and is then made to pass into the melted wax under a hook placed at the bottom of the kettle. The wick, coated with wax, traverses a draw-plate which gives it the desired diameter, and then winds around a second drum. A little tallow, resin and turpentine is often added to the wax in order to give it greater ductility.

Wax matches, also, which are generally of paraffine, are made with the draw-plate. They are afterward cut to the proper length and tipped with a paste of inflammable material. The use of wax for candles, by reason of their cost, was never very widely diffused, and of course at the present day is likely to diminish greatly. See WAX.

Hollow candles are provided with three apertures extending throughout their entire length. They offer the advantage of not guttering when burning. They are manufactured by means of a special machine, the molds of which contain three solid rods, which are withdrawn before the solidification of the mass.

At the beginning of the 18th century, spermaceti, a product of the cachalot, or sperm whale, came largely into use for the manufacture of candles. The competition of other materials and the decline of the whale fisheries limit its use at the present day.

Cetin, a form of spermaceti, is too brittle and lamellar in texture to use alone in candlemaking. These defects are corrected by the addition of about 3 per cent of wax.

Paraffine candles came into general use about 1850. When crude petroleum is distilled the products obtained consist of light oils employed for illuminating purposes, and heavy oils used as lubricants. These latter, upon cooling, yield a solid substance of waxy consistence and deep color, called paraffine. This material, when purified, gives a white, odorless combustible substance, which is made into candles which give a brilliant but slightly smoky flame. Objections to their use are that at the moment of extinction they emit a disagreeable odor, and that they are too fusible and apt to become distorted in a warm atmosphere. For these reasons paraffine is generally mixed with stearic acid. The use of paraffine candles is most common in Great Britain. See PARAFFINE.

Ozokerit, or *cérésine,* which is also used in the manufacture of candles, resembles paraffine in appearance. It is obtained by purifying a sort of natural mineral wax, the principal deposit of which is found in Galicia. It is not much used except in Germany and Austria. Since cérésine candles melt at a higher temperature than paraffine, they undergo no deformation when used.

Palm-oil is obtained from the west coast of Africa, especially the neighborhood of Lagos. The palm which yields it is the *Elias guineensis,* which produces a golden-yellow fruit of the size and shape of a pigeon's egg. By detaching its pulp from the kernel, bruising it into a paste, and then agitating it in boiling water, the oil is separated, and, rising to the surface, concretes as the water cools. About two-thirds of it in weight consists of a peculiar, white, solid fat, called palmitine; the remainder is chiefly olein.

The manufacture of candle-wicks is fully as important as the treatment of the combustible fats, and candle-makers have studied the principles of combustion with a view to discovering methods of producing the clearest light with the minimum of smoke, odor and trouble in snuffing.

A flame is the result of the combustion of a gas. In a burning candle the fatty or other substances are melted and carried by the wick into the interior of the flame, where they are continuously converted into gas. We may compare the combustion of a candle to a microscopic gasworks, and, just as the gas-burner gives more or less light according as the pressure is varied, or the tip is more or less foul, or the proportion of air that reaches the gas is greater or less, just so a candle will give a different light according to the draft of air, the size and nature of the wick. Too large a wick would absorb the melted material too rapidly, the flame would be unduly increased, and the feeding of it would be effected under unfavorable conditions. Too small a wick would produce the opposite effect; around the periphery of the candle there would form a rim, which, no longer receiving a sufficient quantity of heat, would remain in a solid state; the cavity that serves as a reservoir for the liquefied material would become too full; and the candle would gutter. So the section of the candle, the size of the wick and the draft of air in the flame must be apportioned in such a way that there shall always be an equilibrium between the quantity of material melted and that decomposed by the flame. The purity of the air, too, must be taken into account, for, just as a man needs pure air in order to live in health, so a candle has need of the same in order to burn well. During an evening party it may be observed that the brilliancy of the candles diminishes in measure as the air becomes impoverished in oxygen and enriched with carbonic acid.

The wick must be placed in the centre of the candle, or else it will remain too long, produce smoke, and darken the flame. If the end remains exactly in the centre the air will not reach it, and the wick will carbonize and form a «thief» or «waster,» which, falling into the cavity at the top of the candle, will make the latter gutter, and end by obstructing the wick. It then becomes necessary to snuff it. In order to do away with this inconvenience, Gay-Lussac and Chevreul, in 1825, recommended the use of flat or cylindrical wicks of an uneven texture, having the property of curving over. In the same year Cambacérès proposed the use of hollow plaited wicks, which, in measure as the candle burned, had the property of curving toward the white part of the flame. But ashes nevertheless formed, and, obstructing the wick, affected the light. In the month of June 1826 De Milly finally succeeded in solving the problem by impregnating the wick with boric acid. This latter, uniting with the ashes of the wick, gives rise to a fusible body, which is rejected in the form of a drop or bead toward the extremity of the wick. In Austria, wicks are impregnated with phosphate of ammonia, which gives analogous results. Balley has proposed a solution of sal-ammoniac of 2° or 3° Baumé. Consult Calderwood, 'Manufacture of Candles' (London 1891); Lamborn, 'Modern Soaps, Candles and Glycerine' (ib. 1906); Lewkowitsch, 'Chemical Technology and Analyses of Oils, Fats and Waxes' (Vol. II, London and New York 1909).

CANDLE, Electric. See ELECTRIC LIGHTING.

CANDLE-FISH, OOLAKAN, oo'lạ-kăn, **OULACHON,** -kŏn, or **EULACHON,** ū'lạ-kŏn, a sea-fish (*Thaleichthys pacificus*), of the salmon family, frequenting the northwestern shores of America, of about the size of the smelt, to which it is allied. It is a greenish olive on the back, with a white belly, spotted with yellow. It is converted by the Indians into a candle simply by passing the pith of a rush or a strip of the bark of the cypress-tree through it as a wick, when its extreme oiliness keeps the wick blazing. Oulachon oil, a substitute for cod-liver oil, is obtained from it. This fish is a favorite article of food in British Columbia. The name is also applied to a fish in San Francisco (*anoploma fimbria*), or Pacific coalfish. Consult Swan, in 'Proceedings of the United States National Museum' (Vol. III, Washington 1881).

CANDLE-FLY, or **LANTERN-FLY,** a hemipterous insect of the group *Homoptera,* family *Fulgoridæ.* The large Chinese candle-fly (*Fulgora candelaria*) is remarkable for its greatly prolonged head, which was formerly believed to be luminous. Compare LANTERN-FLY.

CANDLE-NUT, the nut of *Aleurites moluccana,* the candleberry-tree, a native of Malaysia, belonging to the family *Euphorbiaceæ.* It is about the size of a walnut, and yields an oil used for food for lamps, and in the manufacture of varnish, while the oily kernels are also strung together and lighted as torches.

CANDLEBERRY, BAYBERRY, CANDLEBERRY MYRTLE, TALLOW-TREE, or **WAX MYRTLE,** a shrub (*Cerothamnus cerifera*) common in eastern North America, where candles are made from the waxy substance collected from a decoction of the fruit. It grows abundantly in sandy soil, and seems to thrive particularly well in the neighborhood of the sea, nor does it ever seem to be found far inland. The berries intended for making candles are gathered late in autumn, and are thrown into a pot of boiling water, where the fatty or waxy substance floats on the top and is skimmed off. When congealed this substance is of a dirty-green color, somewhat intermediate in its nature between wax and tallow. After being again melted and refined it assumes a transparent green hue. Mixed with a proportion of tallow it forms candles, which burn better and slower than common tallow ones, and do not run so much in hot weather. They have also very little smoke and emit a rather agreeable odor. Soap and sealing-wax are also made of this substance. The plant has been cultivated in France and Germany, where it grows in the open air. Another plant belonging to the same family is the sweet-gale (*Myrica gale*), which grows abundantly in bogs and marshes in Europe. It is a small shrub with leaves somewhat like the myrtle or willow, of a fragrant odor and bitter taste, and yielding an essential oil by distillation. It was formerly used in the north of Europe instead of hops, and in some places it is still so used. The catkins or cones boiled in water throw up a scum resembling beeswax, which, collected in sufficient quantities, would make candles. The plant is used to tan calf-skins. Gathered in the autumn, it dyes wool yellow, and is thus used both in Sweden and in Wales. The dried leaves are used to scent linen.

CANDLEMAS, an ecclesiastical festival instituted by Pope Gelasius I in 492, in commemoration of the presentation of Christ in the temple, and of the purification of the Virgin Mary. It is celebrated on 2 February, and has its name from the fact that in the Roman Catholic Church candles are blessed and carried in procession, in allusion to the words of Simeon, spoken of the infant Christ, «a light to lighten the Gentiles.» See PURIFICATION.

CANDLER, Warren Akin, American clergyman: b. Carroll County, Ga., 23 Aug. 1857. He was graduated from Emory College, Oxford, Ga., in 1875, being licensed to preach and entering the North Georgia Conference of the Methodist Episcopal Church in that year. He was in the pastorate until July 1886, when he became editor of the Nashville *Christian Advocate* (the organ of the M. E. Church South), serving in that capacity until 1888. In the latter year he became president of Emory College, but resigned in 1898 when he became a bishop of the M. E. Church South. He has written 'History of Sunday Schools' (1880); 'Georgia's Educational Work' (1893); 'Christus Auctor' (1899); 'High Living and High Lives' (1901); 'Great Revivals and the Great Republic' (1904); 'Dangerous Donations and Degrading Doles' (1909); 'Wesley and His Work' (1912); 'Practical Studies in the Fourth Gospel' (1913).

CANDLISH, Robert Smith, Scottish clergyman: b. Edinburgh, 23 March 1806; d. Edinburgh, 19 Oct. 1873. He was educated at Glasgow University; in 1828 was licensed as a preacher, and in 1834 was transferred from Bonhill to Saint George's, Edinburgh. In 1839 he threw himself into the conflict with the civil courts in the matter of the congregational right of election and independent church jurisdiction in matters spiritual, and soon became, next to Chalmers, the most prominent leader of the "non-intrusion" party and of the movement that culminated in the Disruption of 1843, and the formation of the Free Church of Scotland. From the death of Chalmers till his own death, Candlish was the ruling spirit in the Free Church. In 1862 he was made principal of the New College (the theological college of the Free Church), Edinburgh, and was one of the founders of the Evangelical Alliance. He was the author of 'Contributions Toward the Exposition of the Book of Genesis' (1842); 'Reason and Revelation' (1859); 'The Fatherhood of God'; 'The Two Great Commandments' (1860), etc. Consult 'Life,' by Wilson and Rainy (1888).

CANDOLLE, kän-dōl, **Alphonse Louis Pierre Pyramus de,** Swiss botanist: b. Paris, 28 Oct. 1806; d. 4 April 1893. He was son of Augustin de Candolle (q.v.). He was professor of botany and director of the Botanical Garden at Geneva, published numerous works on botanical subjects, and continued his father's 'Introduction to a Natural System of the Vegetable Kingdom.' In 1714, he succeeded Agassiz in the Academy of Sciences at Paris.

CANDOLLE, Augustin Pyramus de, Swiss botanist: b. Geneva, 4 Feb. 1778; d. there, 9 Sept. 1841. He studied at Paris, where he made his reputation by his 'History of Succulent Plants,' and 'Essay on the Medicinal Properties of Plants.' In 1808 he took the chair of botany at Montpellier, where he replaced the artificial method of Linnæus by the natural method of Jussieu, and published the remarkable 'Elementary Theory of Botany.' After the Restoration of 1815, he returned to Geneva, where he devoted the rest of his life to his great work, 'Introduction to a Natural System of the Vegetable Kingdom,' the continuation of which he entrusted to his son, together with an herbarium of 70,000 species of plants.

CANDON, kän-dōn', Philippines, a town of the province of Ilocos Sur, situated in the northwestern part of the island of Luzon, very near the coast. It manufactures cotton. Pop. about 15,797.

CANDY. See CONFECTIONERY.

CANDY, or **KANDY,** a measure of weight in the East Indies. In Madras the candy is equal to 493.7 pounds, in Bombay it is 560 pounds and in Ceylon it is equal to 500 pounds. It is divided into from 20 to 22 maunds. In Bombay there is a unit of capacity called the candy, equal to 8.2 Imperial bushels, and elsewhere a dry-measure candy is found varying from 15 to 30 bushels.

CANDY CEYLON. See KANDY.

CANDYLARTHRA, a group of primitive animals, ancestral to the ungulate type and especially the perissodactyls, remains of which are found fossil in Cretaceous rocks, and on into the Eocene, where they disappear. They were animals of moderate size, imperfectly plantigrade, with five toes on all feet, teeth adapted to both animal and vegetable diet, and small, smooth brains. The best-known example is *Phenacodus,* found in the lower Eocene formation of the Rocky Mountain region. It had the form of a small tapir, but had a long tail. Their nearest modern representatives of the condylarths, structurally, are the African conies (*Hyrax*).

CANDYTUFT, a genus of plants (*Iberis*), of the natural order *Cruciferæ,* flowering in dense corymbs, and distinguished by an emarginate pouch with keeled and winged valves. Some species are shrubs; some, herbaceous perennials and some, annuals. It is indigenous to the countries bordering on the Mediterranean, and several species, as *Iberis umbellata, Iberis odorata* and others, are cultivated in gardens.

CANE, kān, or **KEN,** a river in Bundelcund (q.v.), British India, a tributary of the Jumna River. It follows a northeast course and is about 250 miles long.

CANE-BRAKE, a term applied to the extensive growths of *Arundinaria macrosperma,* the most gigantic of United States grasses, which occur in the southern portions of the United States, often covering vast extents of country. The plant's stalks are much used for fishing-rods. Cane-brakes are indicative of rich land, as they are only to be found in perfection in the most inexhaustible soils, where, having obtained a foothold, by their more rapid growth they usurp the place of the timber. In the southern portions of the United States the plant often reaches the height of 15 to 25 feet, with a base one to one and a half inches diameter. It grows as straight as an arrow from the root, tapering off finally in a beautiful, thread-like, feathery top. The leaves commence at about two-thirds of the height of the plant, and seem to be attached directly to the stalk, as the branches on which they grow, save the very top ones, are not perceptible to ordinary observation. To the hunter, progress through a cane-brake is one of the most toilsome journeys that can be undertaken. Each step is disputed by the dense vegetation, which rises before the intruder like a wall. In places the cane is sometimes pressed down and interlaced, and then it becomes quite impenetrable. Under the most favorable circumstances the knife has to be freely used. Cane-brakes are often many miles in extent, always lessening in density as they reach high ground. They are favorite haunts for all kinds of game, which seek their solitudes either for protection or for the leaves for food. The deer are particularly fond of the young green leaves, and upon them often become exceedingly fat. Cane-stalks being hollow, having no pith, and being divided inside every few inches into sections, are very combustible when dried in the sun; and the air confined within the hollow sections, warming by the external heat, explodes with very considerable force, so that a cane-brake on fire gives the idea of a continued roar of distant musketry.

CANE SUGAR. See SUGAR AND SUGAR-MAKING.

CANEA, kä-nē'a (Greek KHANIA), Crete, the chief commercial town of the island, situated on the northwest coast, with a good harbor. It occupies the site of the ancient Cydonia, but the present town is due to the Venetians, from whom it was wrested by the Turks, after a two years' siege in 1669. Canea is the principal mart for exporting the productions of the island. Pop. about 20,000. See CRETE.

CANELLA, a genus of plants belonging to the family *Canellaceæ*. They are ornamental shrubs or trees. *C. alba,* the wild cinnamon, is a common West Indian aromatic evergreen tree, growing to a height of from 10 to 50 feet, with a straight stem branched only at the top. It is covered with a whitish bark, by which it is easily distinguished at a distance from other trees; the leaves are placed upon short leaf-stalks and are alternate. They are oblong, obtuse, entire, of a dark, shining green hue, and thick like those of the laurel. The flowers are small, of a violet color, and grow in clusters at the tops of the branches on branched stalks. The fruit is an oblong berry containing four kidney-shaped seeds of equal size. The tree is very aromatic, and when in blossom perfumes the whole neighborhood. The berries, when ripe, are greedily eaten by the wild pigeons of Jamaica, and impart a peculiar flavor to their flesh. The canella of commerce is the bark of the tree freed from its outward covering and dried in the shade. It is brought to Europe in long quills, which are about three-fourths of an inch in diameter, somewhat thicker than cinnamon, and both externally and internally of a whitish or light-brown hue, with a tinge of yellow. This bark is moderately warm to the taste, and aromatic and bitterish. Its smell is agreeable, and resembles that of cloves. In distillation with water it yields an essential oil of a dark-yellowish color, and of a thick tenacious consistence, with difficulty separable from the aqueous fluid. The remaining decoction, when evaporated, leaves a very bitter extract composed of resinous and gummy matter imperfectly mixed. It has been supposed to possess a considerable share of active medicinal powers, and was formerly employed as a cure in scurvy. Now it is merely esteemed as a pleasing and aromatic bitter, and as a useful adjunct in correcting more active though nauseous medicines. The powder is given along with aloes as a stimulating purgative.

CANEPHORUS, a term applied to one of the bearers of the baskets containing the implements of sacrifice in the processions of the Dionysia, Panathenæa and other ancient Grecian festivals. It was an office of honor, much coveted by the virgins of antiquity. The term is often applied to architectural figures bearing baskets on their heads, and is sometimes improperly confounded with caryatides.

CANES VENATICI, kā'nēz vĕ-năt'ĭsī (“the hunting dogs”), one of the northern constellations added by Hevelius in 1690, between Boötes and Ursa Major. Coming in after the time of Bayer, it has none of his assigned letters; but Baily, in the “B. A. C.” in 1845, assigned the letters α and β to the two brightest stars, and they will probably stand, though they have not been universally accepted by astronomers. The former of the two stars is a well-known double. On the maps, the two dogs, Asterion and Chara, are represented as held in leash by Boötes, and pursuing Ursa Major and the celestial pole, but this change in the figure of Boötes has of course been made since the introduction of Canes Venatici into the celestial train. The constellation is surrounded by Ursa Major, Boötes and Coma Berenices. The great whirlpool nebula of this train was discovered by Lord Rosse in 1845, and a fine globular cluster of stars of the 11th magnitude and fainter, notable for the large (nearly one-seventh) proportion of variables among them. Its principal star, to which Halley gave the name Cor Caroli, is a double star with components of the third and sixth magnitudes.

CAÑETE, kăn-yā'tā, **Manuel,** Spanish author: b. Seville, 6 Aug. 1822; d. 4 Nov. 1891. He was educated in Cadiz. For a long time he was an official in the ministry of the interior, and was later chamberlain to King Alfonso XII. His lyric poems, published under the title, ‘Poesias,’ are highly esteemed, and his dramas, also successful, include ‘Un Rebato en Granada’; ‘El Duque de Alba’; ‘La Flor de Besalu’; and ‘La Esperanza de la Patria’ (with Tammayo). He is best known, however, as a dramatic critic and a writer on the history of the Spanish stage. His writings in the field of criticism had much influence in the reform of the stage and were not unconnected with his advancement to important posts in the commissions of Historic and Artistic Monuments and the Inspection of Museums. Among his other works are ‘Farsas y Elogas de Lucas Fernandez’ (1867); ‘La Tragedia Llamada Josefina’ (1870); ‘Escritores Españoles é Hispano-Americanos’ (1884); and ‘Teatro Español del Siglo XVI’ (1885).

CANEY, kā'-nē, Kan., city, Montgomery County, on the Missouri Pacific and on the Atchison, Topeka and Santa Fe railroads, 144 miles southwest of Topeka. It has smelting plants, municipal operated waterworks, and manufactures of glass, oil, flour and bricks. Pop. (1910) 3,597.

CANFIELD, James Hulme, American educator: b. Delaware, Ohio, 18 March 1847; d. New York city, 29 March 1909. He was graduated from Williams College in 1868; admitted to the Michigan bar, 1872, and practised law at Saint Joseph, Mich., 1872–77. He was professor of history in the State University of Kansas, 1877–91; chancellor of the University of Nebraska, 1891–95; president of the Ohio State University, 1895–99, when he was appointed librarian of Columbia University, New York. He was secretary of the National Education Association for five years, and its president for one. Oxford conferred on him the degree of Litt.D. in 1902. He published ‘Taxation: Plain Talk for Plain People’ (1883); ‘The College Student and His Problems’ (1902); ‘A Short History of Kansas’ (1885); ‘Local Government in Kansas’ (1887).

CANG, CANGUE, or **KIA,** the wooden collar or portable pillory, weighing from 50 to 60 pounds, and fitting closely round the neck, imposed upon criminals in China, who are then paraded through the streets and exposed in the public thoroughfare. It renders the wearer unable to feed or otherwise care for himself. On the cang is inscribed the nature of the crime and duration of punishment.

CANGA ARGÜELLES, kăn'ga är-gwĕl'-yĕs, **José,** Spanish statesman: b. Asturias 1770; d. 1843. In 1812 he was a member of the Cortes from Valencia, and rapidly rose to the leadership of the Constitutional party; hence on the accession of Ferdinand VII he was banished. Recalled in 1816, he became Minister of Finance in 1820, when the constitution was restored. Through the abolition of certain direct taxes, he caused financial disorder, and was forced to resign in 1821; was a member of the Cortes in 1822, but fled to England at the time of the revolution of 1823. Returning in 1829, he again was elected to the Cortes, where he remained true to his liberal principles. He wrote ‘Memoria sobre el Crédito Publico’ (1820); ‘Elementos de la Ciencia de Hacienda’ (1825); ‘Diccionario de Hacienda’ (1827, and 2d ed., 1833–34); ‘Observaciones sobre la Guerra de la Peninsula’ (1833–36); and poems, translations in verse from the Greek, etc.

CANGAS DE ONIS, Spain, town, Oviedo province, on the Sella River, 35 miles east of Oviedo. It has busy stock raising and coal mining industries, and is noted for historic incidents. Here the first Spanish Kings resided after the Moorish invasion and here in the 8th century King Pelayo started the Spanish Conquest. The famous cave of Covadonga where he hid is eight miles distant. There are Roman ruins of bridges, etc., and the 19th century church of the Assumption is a replica of the mediæval church which it replaced. Pop. 9,100.

CANGAS DE TINEO, Spain, town of Oviedo province, 37 miles southwest of Oviedo on the Rio Narcea, here spanned by an historic bridge. Situated in a well-watered mountainous and wild region, stock raising, farming and coal mining are active industries and cloth, leather, pottery, liquors, flour and linen are manufactured. Pop. 24,000.

CANIAPUSCAW, kăn-ĭ-ăp'ŭs-kạ, a river in Labrador, outlet of a lake of the same name, flowing northwest into Ungava Bay, Hudson Strait; length, 400 miles.

CANICATTI, kä-nē-kät'tē, Sicily, a city in the province of Girgenti on the Naro, situated in a grain and fruit region. Here are also sulphur mines. The inhabitants are mostly engaged in agriculture. Pop. (1911) 31,204.

CANIDÆ, the dog tribe, comprising wolves, foxes, jackals, dogs and the like, a family of carnivores, intermediate in structure and phylogeny between bears, hyenas and weasels. Their legs are long; the claws non-retractile, and in all except the lycaon there are five toes in front and four behind. The dentitions usually consist of three incisors, a great canine (a tooth which takes its name from its prominence in the dog, and is the seizing and tearing instrument); four small premolars, and two molars on each side of each jaw; but in the lower jaw there are three molars. All these teeth have the carnivorous characteristic of sharp-cutting crowns rather than broad, grinding surfaces, such as characterize the molar teeth of vegetable-eaters. Dogs are mainly diurnal and live in open uplands rather than in forests, where they obtain their prey by chasing it down; they occupy dens and burrows, and possess keen senses and great intelligence. See Dogs. For the fossil history of the family, see Carnivora.

CANIDIA, a Neapolitan woman (real name probably Gratidia), whom Horace loved, and who deserted him. Horace, in an epode and the Satires, gives her name to a sorceress.

CANIGOU, kä-nē-goo', one of the peaks of the Pyrenees in France. It is in the department Pyrénées-Orientales, 24 miles from Perpignan; height, 9,137 feet.

CANINA, kä-nē'nä, **Luigi,** Italian archæologist and architect: b. Casale, Piedmont, 23 Oct. 1795; d. Florence, 17 Oct. 1856. He was for some time professor of architecture at Turin, and afterward lived in Rome, where he published works of great value on the antiquities of Rome, Veii, Etruria and Tusculum, among them ‘L'Architettura antica descritta e dimostrata coi monumenti’ (1839–46).

CANINDE, kä-nēn'dā, a river of Brazil, flowing into the Paranahiba; length, 200 miles.

CANIS MAJOR («the greater dog»), a constellation of the southern hemisphere, remarkable as containing Sirius, the brightest star in the heavens, by means of which the constellation may be located on a continuation of the line through the belt of Orion.

CANIS MINOR («the lesser dog»), a constellation in the northern hemisphere, immediately above Canis Major, the chief star in which is Procyon, lying between Sirius and Pollux. Procyon has a satellite of a star of the 13th magnitude, and the pair revolve about each other about every 40 years.

CANISIUS, kă-nĭsh'ĭ-ŭs, **Petrus** (Lat. trans. of Dutch name, De Hond), Dutch theologian: b. Nimeguen, 8 May 1524; d. Freiburg, Switzerland, 21 Dec. 1597. He was the first man in Germany who entered the order of the Jesuits, of which he became a very active member. In 1549 he was made professor of theology, rector and vice-chancellor of the university at Ingolstadt, and in 1551 court preacher at Vienna. He afterward reformed the University of Vienna, according to the views of the order. His catechism, which has passed through more than 400 editions, is yet in use. He persuaded Ferdinand I to adopt stringent measures against the Protestants, and founded the colleges at Prague, Augsburg, Dillingen and Freiburg in Switzerland. He was beatified 20 Nov. 1864. For his life, consult Reiss (Freiburg 1865); Drews, P. (Hale 1892); Mehler, J. B.

(Berlin 1897); Michel, L. (Lille 1898); Kross, A., 'Canisius in Oesterreich' (Vienna 1898); Braunsberger, O. (editor), 'Epistolæ et Acta' (8 vols., Freiburg 1896 et seq.).

CANISIUS COLLEGE, an elucational institution in Buffalo, N. Y.; organized in 1870 under the auspices of the Roman Catholic Church; reported in 1917: Professors and instructors, 25; students, 530; volumes in the library, 45,000; value of property (including endowment) about $385,000.

CANITIES. Graying of the hair. See Hair.

CANITZ, cä'-nits, **Friedrich Rudolf Ludwig,** German poet and diplomat: b. Berlin, 27 Nov. 1654; d. there, 16 Aug. 1699. He studied law at Leyden and Leipzig, and was made state counsellor in 1697 under Frederick I of Prussia; in 1698 he was given the rank of baron. His poems were first published anonymously after his death (1700) under the title 'Nebenstunde unterschiedener Gedichte'; the second edition with the name of the author appeared in 1719. They had influence on style in opposition to the mannerisms of Lohenstein and other writers of the time. Those most popular with his contemporaries are the satires, elegies and odes, imitating Boileau; and also an elegy on the death of his first wife, Dorothea von Arnim. Consult König, 'Des Freiherrn von Canitz Gedichte' (Leipzig 1727); Varnhagen von Ense, 'Biographische Denkmale' (Vol. IV, Berlin 1824–45); and Lutz, 'Canitz und sein Verhältnis zu dem französichen Klassicismus' (Munich 1887).

CANKER, a disease of plants. See Apple.

CANKERWORM, a caterpillar of a geometoid moth of the genus *Anistopteryx*, destructive to fruit-trees, especially apples. See Apple.

CANLASSI, kăn-läs'sē, **Guido,** Italian painter: b. Sant Archangelo 1601; d. Vienna 1681. He studied under Guido Reni at Bologna, and lived at Venice as court painter under the Emperor Leopold I, and later at Vienna. He is to some extent an imitator of Guido Reni, but is especially distinguished for his use of color. His chief works, mostly biblical or mythological subjects, are in Vienna, Munich and Dresden.

CANNA, one of the Hebrides, 12 miles southwest of Skye, and 3 miles northwest of Rum. It is 4½ miles long, 1 mile broad and 4½ square miles in area. The surface, nowhere higher than 800 feet, consists of trap. A hill here of basalt, called Compass Hill, reverses the magnetic needle.

CANNA, a genus of plants, some species of which have fine flowers, and some, from their black, hard, heavy seeds, are called Indian shot. There are about 50 species in tropical America and Asia, with ornamental leaves, creeping rootstock, and panicles of red or yellow flowers. *C. indica* is the best-known species, and the roots of *C. edulis* yield starch. The plants are very popular in cultivation, especially the hybrids between various species and the improved varieties obtained by selective breeding. A very large number of named horticultural varieties has been produced in recent years.

CANNABIS INDICA. See Hemp, Indian.

CANNÆ, kăn'ē, Italy, an ancient town in Apulia, on the river Aufidus. Its site was between the modern Canosa and Bartletta, and was famous for the battle in which the Romans were defeated by Hannibal (216 B.C.). The Roman army under the consuls Æmilius Paulus and Terentius Varro consisted of 87,000 men, while that of the enemy amounted only to 50,000, among whom were 10,000 horse. The battle was brought on by Varro against the better judgment of his colleague. The Romans left their strong position at Canusium on the banks of the Aufidus, and the whole army crossed the river. Varro drew up his troops on the plain, with his right wing protected by the river. At the same time Hannibal forded the Aufidus and led his small army to the attack. The battle was long, and the Romans fell in great numbers, among them the consul, Æmilius Paulus, and both the proconsuls Servilius and Atilius. Hannibal's Numidian horse destroyed those who fled from the field. The victor made 13,000 prisoners. The Romans lost, according to their own lowest statements, 45,000 men; according to the highest, 70,000. Hannibal collected the gold rings of the knights who had fallen and sent some pecks thereof to Carthage.

CANNAN, Edwin, English economist: b. 1861. A student at Balliol, Oxford, he was engaged as lecturer at the London School of Economics (1897) and became professor of political economy in the University of London (1907). He is widely known in advanced circles as author of 'Elementary Political Economy' (1888, 3d ed., 1903); 'History of the Theories of Production and Distribution' (1893, 2d ed., 1903); 'History of Social Rates in England' (1896, 2d ed., 1912); 'The Economic Outlook' (1912); 'Wealth' (1914). He also edited Adam Smith's 'Lectures on Justice, Police, Revenue and Arms' (1896), and the same author's 'Inquiry into the Nature and Causes of the Wealth of Nations' (2 vols., 1904).

CANNEL COAL. See Coal.

CANNELTON, Ind., city and county-seat of Perry County, 150 miles south of Indianapolis, on the Southern Railroad, and on the Ohio River. It has cotton mills, flour mills, foundry and machine shops, potteries, brick yards and sewer-pipe manufactories. Coal and sandstone are mined in the neighborhood and gas and oil are also found. The city owns the electric-lighting plant and the waterworks. Pop. 2,136.

CANNES, kän, France, a seaport and health resort on the shore of the Mediterranean at the west end of the Riviera, 22 miles southwest of Nice, in the department of Alpes-Maritimes. It is beautifully situated in a rich fruit district. It is famed for its mild and equable climate, with an average winter temperature of 50°, and an average of about 70 days on which rain falls in the year. Since its discovery as a health resort by Lord Brougham in 1831 it has become celebrated as a wintering station. There are many hotels and fine villas, charming public walks, etc. Perfumes and soap are made here and anchovies, oils and fruit are among the articles exported. It is a place of great antiquity, and twice suffered destruction at the hands of the Moors. On the island of Sainte Marguerite opposite, the Man with the Iron Mask was imprisoned from 1686–98. Near

Cannes, 1 March 1815, Napoleon landed on his escape from Elba. Pop. (1911) 29,656.

CANNIBALISM, the act or practice of eating human flesh by mankind. In his accidental discovery of the West Indies Columbus heard of, if he did not himself see, the Carib Islands, the inhabitants of which were spoken of as Caribales, or, owing to the customary dialectical interchange of *l*, *n* and *r*, Canibales. These Canibales or Caribales were reported to be man-eaters. This terrible association of Canibales with the practice of eating human flesh naturally enough led straightway to the transfer of the name of the people to their horrid custom. The Greek word, anthropophagy (ἀνθρωποφάγος), coming down from pre-Christian times, indicates that the practice, though unknown to Columbus, was ancient and well enough known to be in the literature of the older peoples. The story of Polyphemus devouring human flesh as told in the 'Odyssey' and other legends of semi-divine man-eaters is evidence enough that the ancient authors knew, by hearsay at least, of this practice. It is a well-established fact that all races of men have at some time, in a greater or less degree, been guilty of the practice of eating human flesh for one purpose or another. It is very generally believed, and with a good show of reason, that there never has been a time, since man first appeared, down to and including our own, when the world has been free from cannibalism. It is nearer being free from it now than it has been perhaps in all past time. To-day it exists among isolated South American tribes; in West Equatorial and Central Africa; in the Malay Archipelago, some of the South Sea Islands (mainly in Melanesia) and in parts of Australia. Excluding Australia cannibalism may be said to be confined to a belt of land extending to a little more than 10 degrees north and south of the equator.

How far back the practice goes it is not possible to tell. So far as is known there is nothing to warrant the belief that the ancestors of the human species or the first of the human species ate one another. There is little if any evidence to indicate that down to as late a period as the close of the Old Stone Age the several races of men which had successively inhabited Euro-Asia and northern Africa practised cannibalism. Cannibalism is not universally characteristic of the savage state. A few charred and broken and scraped human bones from the cave-dwelling period are substantially all that has been found which can by any stretch of the imagination be supposed to hint at this practice. Tylor goes as far as the facts seem to warrant when he says that this evidence may «perhaps be taken to show that prehistoric savages were in this respect like those of modern times neither free from cannibalism nor universally practising it.» Cannibalism originates in and is carried on from widely different motives, ranging all the way from eating human flesh as a regular part of daily subsistence to the eating of it for purely magical or ritualistic reasons. It is not possible to draw a dividing line between the several kinds because all or nearly all forms are more or less interrelated. This may arise from the fact that usually the practice does not begin in a single motive.

As a Means of Subsistence.— The most repulsive and degrading form of cannibalism is that of eating human flesh as a part, the main part, of the regular diet. The negro tribes along the Guinea Coast southwards into the Kongo and for some distance eastward eat human flesh as food. It is treated just as other races treat animal flesh. Raids are made to capture prisoners and they are herded and kept till wanted. Sometimes they are fattened just as other races fatten animals for the slaughter. Under great stress of hunger occasioned by shipwrecks, sieges and famines civilized persons have been driven to the eating of human flesh. The siege of Samaria about the middle of the 8th century B.C. (II Kings vi, 24ff); the siege of Paris in 1590; and the famine in Algiers in 1868 furnish instances of this. What civilized people are driven to do by the pressure of hunger it is not surprising that the savage should do with even greater readiness under similar circumstances. Many savage races have resorted to cannibalism only in times of famine. The Mungerra tribe in Queensland in times of severe famine «kill and eat some of their female children.» The natives of Tierra del Fuego, when starving in winter, «throttle and devour the oldest woman of the party. When asked why they did not kill and eat the dogs, they reply 'Dogs catch otters.' »

As Manifestation of Affection.— Incredible as it may seem cannibalism in some instances seems to be prompted by affection. The Binderwurs of Central India killed and ate the sick and aged, «thinking this an act of kindness and acceptable to the goddess Kali.» The aborigines of southwest Victoria practise eating human flesh in a solemn service of mourning for the dead, particularly for those killed by accident. «The Tangara carry their dead about with them, and whenever they feel sorry for their death, they eat some of the flesh till nothing remains but the bones.» Among still other peoples parents partake of the flesh of their dead children «as a token of grief and affection for the deceased.» The practice of eating flesh for the purpose of honoring dead kinsmen is of a similar character. Herodotus, writing of the Massagetæ, a Scythian people living in the northeast of the Caspian, relates that when a man has attained a great age among these people it is the custom for his kinsmen to sacrifice him, boil his flesh with the flesh of cattle and eat it. This is accounted an exceedingly happy ending. Lyden describes a cannibalistic custom which has the appearance of a very pious ceremony. The aged and infirm invite their descendants to eat them. The victim ascends a tree around which the others assemble singing a funeral dirge: «The season is come, the fruit is ripe, and it must descend.» He then descends, and is put to death and eaten in a solemn banquet.

As a Ritualistic Practice.— Cannibalism as a religious institution is one of the most widespread and persistent forms of the practice and it ranges all the way from almost a passable refinement to the most revolting orgies. The religious purpose is not always the same. In some instances it is due to a desire, as among some Australian tribes, who make a practice of eating their totems, to become identified with the totem or god. In other cases the desire is simply to establish a close bond of friendship between the flesh-eating god and themselves. The peoples who offer human sacrifices to the god eat of these sacrifices, believing that by so doing they directly and surely become possessed of the divine virtues supposed to proceed from such sacrifices. With the Khonds it was the custom for a girl representing the goddess Tari to be sacrificed and torn limb from limb by the worshippers eager to obtain a piece of the deified victim. Cannibalism as a purely religious exercise among people possessing a high degree of culture is best and most notoriously illustrated by the Mexican custom of offering human sacrifices to the god Huitzilopochtli. "The victims were enemies or slaves and were offered before the images of the gods. The priest cut open the breast with an obsidian knife, tore out the heart and offered it to the gods; then he sprinkled his assistant and the offerers with the blood. After this a cannibal feast on the body took place, priest and offerers partaking." Early writers say these cannibalistic sacrifices reached yearly into the thousands. To obtain rain from the rain-god Quiateot, children and adults were sacrificed to him and his images were sprinkled with their blood.

As Magic and Medicine.— One of the most varied forms of cannibalism is that originating in the belief that by eating human flesh or certain parts of the human body very important advantages would be gained. Dead relatives in some instances are eaten in the belief that the soul of the deceased will thus pass into the eater, and he thereby become possessed of all the desirable qualities of the dead man. In other instances the body of an enemy was eaten because that was the way to destroy the soul and thus put an end to further menace. Landor reports that in Tibet the dead is eaten partly by the Lamas and in part by the relatives, it being believed that the spirit whose flesh has been eaten will always remain friendly. The Botocudos ate an enemy to render themselves invulnerable against the arrows of the hostile tribe. Among some peoples at the founding of a new town a human victim was slain and the heart and liver eaten by all present so that they might not die within the year. In I Kings xvi, 34, is reflected a survival of a similar custom. The idea that the eating of human flesh endows the eater with distinctly magical or supernatural powers is frequently met with in the savage world. In East Central Africa it is quite generally believed that the uncanny powers supposed to be possessed by witches and wizards are obtained by the feeding of the latter upon human corpses. From this comes, naturally enough, the belief that whoever feeds on human flesh will have the power of witches and wizards.

Not infrequently cannibalism has arisen from an almost uncontrollable passion for revenge, and a savage belief that eating an enemy is the surest way of bringing about his lasting disgrace. The ferocious natives of New Caledonia do not consider that revenge is complete until they have devoured the slain. The cannibal practices in Samoa seem to have had hatred and revenge as the motive. "I will roast thee" was the greatest insult that could be offered a Samoan. For a long time after the practice was abandoned, captives, in token of submission, would offer burning wood and say "Kill and cook us when it seems good to thee." The Tupis of South America ate their dead enemies, and the children were brought home captive and cared for till the age of 14 when they were slain and eaten. Instances have been met with where the criminal enemies within the tribe are slain and eaten. Where this is the custom it is usually the chief alone who has the privilege of eating the offending tribesmen. In some cases it is not easy to distinguish between this custom and that of mere gluttonous cannibalism. The chief goes so far as to cause a tumult to be raised. As a punishment the offender is slain and the chief invites guests to share in the meal of human flesh. So powerful an incitement to cannibalism is this passion for revenge that quite civilized peoples have been guilty of it.

Other Motives.— There are several other motives leading to cannibalism more or less distinct from those mentioned. Among some peoples the flesh of a fallen enemy was eaten after the fight by both contending parties as a token of entering into a binding covenant of peace. At the coronation of a king in the Sandwich Islands it was the custom for the new king to swallow the left eye of a human victim that he might thus receive an accession of strength. Among the Indian tribes of the Northwest of America cannibalism took the form of initiation into certain secret societies — a sort of ritualism. At the beginning of the initiation into the cannibal society the person is supposed to become possessed of the cannibal spirit, and so of a violent desire to eat human flesh. In olden times, when the cannibal was in a state of ecstasy, slaves were killed for him and he devoured them raw. Cannibal practices are of almost infinite variety, and perhaps all, except where human flesh is eaten simply as food, have their root in a superstitious view of life and the world. Naturally the practice has been disappearing before the progressive enlightenment of the world, and even the tribes who are still guilty of eating human flesh as food are increasingly ashamed of it, very often carrying on the practice in closely guarded secrecy.

The bibliography of the subject covers a multitude of publications. Articles on anthropology and ethnology in journals devoted to such subjects will yield much information; also the narratives of travel and adventure by well-known explorers of early and later times. A few might be mentioned simply as suggestions: Weeks, 'Among Congo Cannibals'; Frazer, J. K., 'Totemism and Exogamy'; Stanley, H. M., 'In Darkest Africa'; Landor, W. S., 'In the Forbidden Land'; Rannie, 'My Adventures Among South Sea Cannibals'; Dennys, 'Folklore of China.'

CANNIFF, William, Canadian physician: b. Thurlow, near Belleville, Ontario, 1830; d. 1910. He was educated at Victoria College, Cobourg, and studied medicine in Toronto, New York and London, England, where he took the degree of M.R.C.S. He served in the Crimean War, 1856; returned to Canada, became professor of pathology in Victoria College; visited the Washington hospitals during the Civil War, and finally settled in the practice of his profession at Toronto. He was one of the originators of the "Canada First" movement. He was the author of 'The Medical Profession in Upper

Canada, 1783–1850' (1894); 'The Settlement of Upper Canada' (1872).

CANNING, Charles John (Earl), English statesman, son of George Canning (q.v.): b. near London, 14 Dec. 1812; d. London, 17 June 1862. He was educated at Eton and Oxford. He entered Parliament in 1836 as member for Warwick, and in the following year succeeded to the peerage, on his mother's death, as Viscount Canning. In 1841 he was appointed under-secretary for foreign affairs in Peel's government, and in 1846 commissioner of woods and forests. In the Aberdeen ministry of 1853, and under Palmerston in 1855, he held the Postmaster-Generalship, and in 1856 went out to India as governor-general. Throughout the mutiny he showed a fine coolness and clear-headedness, and though his carefully pondered decisions were sometimes lacking in promptness, yet his admirable moderation and the implicit trust he imposed in able military subordinates did much to re-establish the British empire in India. In 1858, when the government of India was transferred from the East India Company to the Crown, Canning became the first viceroy; and in the succeeding year he was raised to the rank of earl. From that time till his retirement in March 1862, the arduous task of undoing the mischief wrought by the mutiny devolved upon him, and his great success was a witness to his ability. Consult Cunningham, 'Earl Canning' (1891); Hare, A. J. C., 'The Story of Two Noble Lives' (1893).

CANNING, George, English orator and statesman: b. London, 11 April 1770; d. Chiswick, 8 Aug. 1827. His father offended his family by marrying a lady of beauty and accomplishments, but without fortune, and died in 1771, leaving her destitute. She however lived to see the success of her son, from whom she ever received the tenderest marks of filial love. Canning, who had inherited a small estate in Ireland, was educated at Eton. In 1787 he was entered at Oxford. His vacations were passed with Sheridan, by whom he was introduced to Burke, Fox and other distinguished Whigs. But although Sheridan had already announced him in Parliament as the future ornament of his party, Canning entered into terms with Pitt, by whom he was brought into Parliament in 1793. During the first session he remained silent. In 1796 he was under-secretary for foreign affairs. In 1797 he projected, with some friends, the *Anti-Jacobin,* of which Gifford was appointed editor. Canning contributed many poetical and other articles to this periodical, the happiest of his efforts in this direction being the 'Needy Knife-grinder.' In 1798 he supported Wilberforce's motion for the abolition of the slave-trade. In 1800 Canning increased his fortune and influence by a marriage with Joanna, daughter of General Scott, a lady of ample fortune. The administration being dissolved in 1801, Canning became a member of the opposition until the restoration of Pitt in 1804. In 1807 he was appointed Secretary of State for Foreign Affairs in the Portland administration. A political misunderstanding with Lord Castlereagh led to a duel between that minister and Canning, in which the latter was slightly wounded. This dispute occasioned the dissolution of the ministry. In 1810 he opposed the reference of the Roman Catholic claims to the committee of the whole House, on the ground that no security or engagement had been offered by the Roman Catholics. Some of his most brilliant speeches were on this subject. The adoption of the measure being a matter of policy, the state of opinion, the condition of affairs, and the securities with which it should be accompanied, were with him elements of the question. He proposed securities in 1813, which, with the bill, were rejected. He supported in 1812 and 1813 the same motion which he had opposed in 1810. To Canning was principally owing the first blow which shook the throne of Napoleon: the British policy in Spain was directed and animated by him. In 1812 he was elected member for Liverpool, from which he was also returned in 1814, 1818, 1820. In 1814 he was appointed Ambassador Extraordinary to Portugal, and remained abroad about two years. In 1819 he declared his decided hostility to parliamentary reform in whatever shape. On the occasion of the proceedings relative to Queen Caroline, the discarded wife of George IV, he declared that "toward the object of that investigation he felt an unaltered regard and affection"; and soon after resigned the presidency of the board of control and went abroad. Having been nominated governor-general of India, he was on the point of embarking when the death of the Marquis of Londonderry called him to the Cabinet as Secretary for Foreign Affairs, 16 Sept. 1822. One of his earliest acts in this situation was to check the French influence in Spain, the French having sent an army into that country to put down the revolutionary party. By way of withdrawing the Spanish-American colonies from French influence he decided to recognize their independence; thus, as he afterward phrased it, "calling the New World into existence to redress the balance of the Old." He continued to support the propositions in favor of the Roman Catholics, and in 1825 communicated to foreign ministers the determination of the government to appoint *chargés d'affaires* to Colombia, Mexico and Buenos Aires. In consequence of the attempts made by Spain to assist the malcontents of Portugal, it was immediately determined by the ministry to support the regency in that country, and troops were sent to Lisbon in January 1827. On 12 April 1827 his appointment as Prime Minister was announced. His administration was terminated by his death, but not until it had been crowned by the Treaty of London (6 July), for the settlement of the affairs of Greece. As an orator Canning was showy and graceful, with a brilliant wit and caustic satire, though neither formed on a very masculine taste. During his career the leading domestic subjects on which the British Parliament was called upon to legislate were the following: the liberty of the press, the emancipation of the Roman Catholics, the test and corporation acts, the corn-laws and reform in Parliament. Those of a foreign nature were, among others, the various overtures of peace between Britain and France, the settlement of Europe on the overthrow of Napoleon, the treatment of Italy by the Austrians, the Spanish revolution and recognition of the South American republics. On all these questions with one or two exceptions, he supported the high Tory side. The chief exceptions were the emancipation of the Roman Catholics and the recognition of the South American republics. He was also desirous of reforming the corn-laws. His speeches, edited by Thierry, were published in six volumes in 1830. Consult Stapleton, 'Political Life of Canning' (1831); Stapleton, 'Canning and His Times' (1835); Temperley's 'Life of Canning' (1905); Bagot, 'George Canning and His Friends' (1909); Marriott, 'George Canning and His Times' (1905); Lord Dalling, 'Historical Characters' (1867).

CANNING, Sir Samuel, English civil engineer: b. Wiltshire 1823; d. 24 Sept. 1908. He is best known in connection with the laying of the Atlantic cables, and those in the Mediterranean and North seas. He was knighted in 1866.

CANNING, Stratford (1st Viscount Stratford de Redcliffe), English diplomatist, cousin of George Canning (q.v.): b. London, 4 Nov. 1786; d. 14 Aug. 1880. His father, Stratford Canning, who had been disinherited owing to an imprudent marriage, and had gone into business as a merchant, died a few months after his son's birth, and in consequence young Stratford and his mother removed to Wanstead. He went to Eton, and in 1805 he was elected to a scholarship at King's College, Cambridge. Before graduating he was in 1807 appointed by his cousin, George Canning, then Foreign Secretary, to be his précis writer, and in the latter part of that year was sent as second secretary with a mission to Denmark. In the following year he accompanied as first secretary an important mission to Constantinople, which resulted in the conclusion of a treaty of peace with the Porte on 5 Jan. 1809. In the summer of 1810 his chief, Sir Robert Adair, was transferred to Vienna, and Canning temporarily succeeded him as Ambassador at Constantinople. Before the arrival of Adair's successor, Canning made his reputation as a diplomatist by the masterly way in which he conducted the difficult negotiations which led to the signing of the Treaty of Bucharest on 28 May 1812. This treaty put an end for the time to the war between Russia and Turkey, and thus left Russia free to resist the advance of Napoleon. Moreover, it firmly secured English predominance at Constantinople, and was in this respect the first notable triumph in the traditional British policy on the Eastern Question. In 1812 Canning returned to London, and after declining in 1813 the offer of the chief secretaryship to Lord Aberdeen's Vienna mission, accepted in the following year the post of Envoy Extraordinary and Minister Plenipotentiary in Switzerland. He held this post till 1818, and was completely successful in his endeavors to free Switzerland from French domination and to erect it into a neutral federal republic. Shortly after his return he was appointed Ambassador to the United States and he arrived at Washington in the autumn of 1820. He was again in London in 1823. The diplomatic agreement arrived at in 1824 was, however, thrown out by the United States Senate. After a brief but important mission to the Russian capital he was again sent to Constantinople in October 1825 as Ambassador. In the following year he succeeded in again patching up a peace between Russia and Turkey, and thus prepared the way for a joint representation by England, France and Russia on behalf of insurgent Greece. Negotiations were, however, abruptly broken off by the Sultan's indignation on learning of the battle of Navarino, and Canning was later in the same year engaged, along with the representatives of France and Russia, in drawing up proposals for establishing a Greek kingdom. These were ultimately forced on the acceptance of Turkey in a more stringent form as part of the peace treaty which ended the Russo-Turkish War of 1828-29. In 1829 he resigned his position and returned to England, where he was created G.C.B. He entered Parliament as member for Old Sarum, but he ultimately secured election for King's Lynn. In 1830 he drew up the British case in the Saint Croix-Saint Lawrence boundary dispute with the United States for submission to the King of the Netherlands. After acting as special envoy to the Porte in 1831-32, and to Portugal in 1832-33, he was in 1841 appointed for the third time Ambassador at Constantinople. For a considerable period he was mainly engaged in assisting and encouraging the Sultan, Abd-el-Mejid, in his policy of reform, but after a visit to England in 1852, during which he was raised to the peerage, his efforts had to be directed to thwarting Russian designs. His diplomatic triumph over Prince Mentchikoff caused the Tsar in a moment of irritation to precipitate the Crimean War. He resigned in 1858, and the remainder of his career was passed mainly in retirement. In addition to a few volumes of poetry, he published works entitled 'Why am I a Christian?' (1873), and 'The Greatest of Miracles' (1876). A selection of his articles on Eastern affairs was published in 1881 under the title of 'The Eastern Question.' See 'Life' by Stanley Lane-Poole (1888).

CANNING AND PRESERVING INDUSTRY. The hermetical sealing of food, generally termed "canning," has long since passed the experimental stage and is now one of the leading industries of the country. The inventive genius of man has from the earliest times turned toward some method of preventing articles of food from deteriorating, and toward some way of preserving food so that it will be palatable at some future time. "Desiccation" or drying was probably the first method used, but the food thus preserved lost its natural flavor and became tough in texture. Prior to 1750 this method of drying, and that of using salt and sugar, were the only methods in use for preserving food. From 1809-10 a Frenchman, Nicholas Appert (b. 1750; d. 1841), evolved a plan for hermetically sealing foods for use at sea, and his process was purchased by the French government, which gave it to manufacturing firms in France and England for use in producing canned goods. Appert described his invention as an inexpensive and simple method of preserving various sorts of animal and vegetable food in perfect condition for an indefinite period. He gave the world one of the principles involved in the art of canning, and since his time there have been several new principles discovered equally as important as his sterilizing process, which did not take in the prevention of souring prior to sterilization. There have also been other improvements in machinery especially adapted to the principles involved, whereby cost has been enormously reduced, so that food preserved in tins is within reach of all classes of consumers. He was later awarded a prize of 12,000 francs by Napoleon, but spent most of this money for further experiment and died when over 90 years of age, after having seen his process thoroughly tested and put into operation.

In 1810 the English government granted a patent to Peter Durand for the preservation of fruits, vegetables and fish in hermetically sealed cans, made of tin, glass or other fit material. He made no claims to the discovery of the process, and it was stated at the time that he received his information in regard to it from a «foreigner residing abroad.» The methods, despite the secrecy in their use, gradually became known, and in the course of time came to America. It is believed that a man by the name of Ezra Daggett was the first to put the practice of canning goods into actual use in this country, in the years from 1815 to 1818. He with his son-in-law, Thomas Kensett, began to manufacture hermetically sealed goods, on a large scale in the year 1819, and the principal foods thus packed were salmon, lobsters and oysters. A patent was granted them in 1825 on the use of the tin can, or «case» as it was then called, and they immediately started the use of this process in their factory. Glass jars were then very little in use, because of their costliness, bulk and inability to withstand the extremes of temperature.

In 1820 William Underwood and Charles Mitchel combined, in Boston, for the purpose of manufacturing foods in hermetically sealed cans. The principal business engaged in during the early days of the combination was the preperation of pickles, jams, jellies, sauces and mustard; but they also put up quinces, cranberries, currants, etc. About the same time, Allen Taylor and M. Fallagher, who had learned their trade in Ireland, came to this country and were for some time employed in New York. They with Kensett did much to put the industry on a permanent basis. In 1839 William Underwood began to substitute tin for glass, though it was a number of years before the jar and bottle gave way entirely to the «tin can.» The methods of can-making were for many years very slow and primitive. A tinker who could turn out 60 cans a day was a master workman, for every can was made by hand. The body for each had to be measured, marked and cut out from the plate by hand shears, and, to make the seam or lap secure and air-tight, it was thought necessary to pile on the solder until a ridge an eighth of an inch thick was built up from end to end. It was also a slow and difficult operation to make the covers and bottoms. Each one had first to be drawn on the tin with compasses and then cut out with the shears, and finally, with a mallet, the edges struck up or bent, over an upright piece of iron called «a heading stake.» The tops and bottoms, like the seams, were soldered on with a heavy beading of metal, and enough solder was used on one can to make a dozen of to-day's manufacture.

So was born the tin can that now is scattered in every direction, along the paths of travel and progress; but, strange enough, this growing infant had, in its younger days, another name, one which more became its infantile and clumsy form — «The Tin Canister.»

In all the correspondence for the next 10 or 15 years, cans or canned goods never seem to be mentioned. They were always spoken of as hermetically sealed goods in canisters or tin cases. In the salesbook or «Waste,» as it was then called, canisters were abbreviated thus, «Cans,» and probably by such abbreviations, tin packages for food came ultimately to be known as cans.

The stamp-can was invented in 1847 by Allen Taylor and was a decided improvement over any previously made. Two years later, 1849, Henry Evans, Jr., of New Jersey, brought forth the «pendulum» press for making can tops, and so the improvement in the manufacture of cans has gone on till now we have the key-opened can, the invention of a Mr. Zimmerman. While the manufacture of cans has become a distinct industry and not now generally connected with the canning industry, nearly 10 per cent of those now in use are made by the canning establishments. These cans are made from sheets of tinned steel, 14x20 inches in size and weighing about one pound. The objection to tin cans as containing poisonous acid or injurious substances has caused the methods of manufacture to be carefully scrutinized, so that now all cans are subjected to an acid preparation for removing dirt, grease, etc., and then coated with pure tin by the acid process or palm-oil process, the latter of which is considered the safer.

In the methods of cooking there have been many improvements, the slowness and low temperature of 212° F. allowable in the Appert process being gradually raised by the use of chloride of calcium, till now a temperature of 250° F. is possible, although this process is more expensive, as the cans become discolored and have to be cleaned before they can be put on the market. The «closed-kettle» process of cooking goods by means of superheating water with steam was invented by A. K. Shriver of Baltimore, and about the same time, the invention of the patent-process kettle, securing similar results by the use of dry steam, was brought out by John Fisher of the same city. One of the modern systems for sterilization is the Continuous Calcium Process System, patented by the Sprague Canning Machinery Company of Chicago. Another is the Continuous Process System in oil, used by the packers of canned meats. Another is the Polk Agitating System, patented by Ralph Polk, of Greenwood, Ind. By this system the time of sterilization is materially shortened.

The canning industry, although established in the United States as early as 1825, did not become of much importance until the middle of the century, but from 1850 came to the front by leaps and bounds. In 1889 the products of the industry were valued at $46,600,000; in 1899 at $99,335,000; in 1904 at $130,466,000; in 1909 at $162,000,000; and in 1914 at $235,000,000. This last tremendous increase appears to be partly fictitious, owing to the fact that more foods are now reported by the census under the heading of «canning.» For instance, condensed evaporated milk totaled $58,747,000 in 1914, or nearly one-sixth the entire production.

Many unaccountable losses were met with, when in certain years the canned goods would not all keep. Numerous theories were experimented with, in vain efforts to learn the cause of these mysterious deteriorations.

In some cases it seemed certain that spoiling was caused by freezing. Some salmon had been stored in a warehouse, which, during the winter, had not been constantly heated. Many cans of this lot spoiled; so the freezing theory was accepted and held good, until some other cans from the same packing spoiled, which could not possibly have frozen. To explain this new phase of the situation, another theory had to be concocted.

In searching for the probable origin of these mysterious losses, the real cause was not suspected. The exclusion of air was thought to be one of the most important factors in keeping the goods, and, until recently, this opinion has prevailed.

The researches in bacteriology in 1895–99 at the Massachusetts Institute of Technology brought out the fact that in some cases the spoilage of canned goods was due to imperfect sterilization through lack of sufficient heat to destroy all bacteria. This, however, accounted for only a small per cent of the spoilage cases. There are several other causes which have been brought out by the research work of Edward W. Duckwall, M.S., in the Sprague Canners' Laboratory, an institution which was founded in August 1903 by Mr. Daniel G. Trench of Chicago. (The name of this laboratory has since been changed to the National Canners' Laboratory). It was discovered that a large per cent of what is known as «sour» corn and peas was due, not to insufficient sterilization, but to souring which had been accomplished by bacteria in the raw product prior to the sterilizing process. It was also discovered that some of the spoilage was due to the evolution of carbonic acid gas from the seeds of certain fruits and vegetables. The germ life of the seeds was not destroyed by the heat, and carbonic acid was liberated when the seeds sprouted in the cans. Gradually all obstacles are being overcome; new processes have been invented, the purity of the canned article has been proved by expert chemists and the manufacture has become general in every part of the United States where fruits or vegetables are grown or where the supply of fish and oysters is nearby.

The installation of labor-saving machinery, the remarkable growth in the number of firms, the decline in the market value of the goods, made necessary uniform grades and rates of sale throughout the country. In October 1872 the first organization of canned goods packers met in Philadelphia, but this was only short-lived, and it was not until February 1883 that a permanent exchange was established. The «Canned Goods Exchange» of Baltimore was at that time organized, with the intention of having sales on the floor daily, but after a thorough trial they abandoned that plan and adopted grades for goods, and rules and terms governing transactions. These exchanges began rapidly to come into existence. In 1885, the «Western Canned Goods Packers' Association» was formed, composed of those doing business in the Mississippi Valley. In the same year the New York State packers organized, and two years later those of New Jersey and Virginia. In May 1889 the National Association was formed at Indianapolis, followed by the «Peninsula Packers' Association» of Delaware, formed in 1894, and the «Atlantic States Canned Goods Packers' Association» of Baltimore, organized in the fall of the same year.

The localization in the canning industry is principally due to climatic conditions. California has forged ahead and monopolized one-fourth of the industry, New York producing over 10 per cent and Maryland 7½ per cent. in 1914. Thus we have Illinois, Maine, Iowa, New York, Ohio and Maryland as the principal corn-packing States; Maryland, New Jersey, Delaware, Indiana, Virginia and California as the tomato-canning States; while Wisconsin, New York, Illinois and Ohio produce the largest amount of canned milk; Maine is the principal packer of sardines, while Washington and Oregon monopolize the salmon canneries. Peaches are principally canned in California, Maryland, Michigan and Georgia; New York, Michigan, Maryland, California and Maine put up the major portion of the apples packed, though the industry is carried on to some extent in Washington and Oregon. Pears are packed mainly in California, New York and Maryland, while pineapples are almost wholly packed in Baltimore, Md. Beans are canned mainly in Indiana, New York, Maryland and Illinois; peas in Wisconsin and New York; prunes and raisins are dried almost wholly in California; nearly all the salt fish is packed in Massachusetts.

For general purposes of comparison, the canning and preserving industry may be divided on the lines of the United States census statistics into four distinct classes: Fruits and vegetables; fish, both canned smoked and dried; oysters and clams; and pickles, preserves, jellies and sauces; and under these headings the industry may be more comprehensively discussed. The canning and preserving of fruits and vegetables gives employment to over 50,000 persons; that of fish to 9,000; and that of oysters, etc., to over 2,000.

Fruits and Vegetables.— Fruits were the first foods to be successfully canned, as the low temperature used in the early methods was more easily applied to this class of goods because less heat is required to preserve them than all others. Glass bottles were filled up to the neck, loosely corked, and then placed in tepid water, the temperature of which was gradually raised from 170° to 190° F., remaining there for a period varying from 30 to 60 minutes according to the article being preserved. In 1823 Pierre Antoine Angilbert made an improvement on this method by placing the fruit in a tin can containing water, then placing on the cover in which there was an aperture to allow for gas escape. It was then placed in water and heat applied; after boiling a sufficient length of time, the aperture was closed by a drop of solder.

Not much is known of this branch of the canning industry between the years 1820–45, and it probably was not very extensive, and it is certain that tomatoes and corn were not put up to any great extent during those years. It appears from a narrative presented by William Lyman Underwood that his grandfather, William, began to use the Appert process about 1820, and exported preserved goods to Manila in 1821. In 1830 he packed pie fruit in bottles, and in 1830 imported tomato seed. His son, William J., has a label used in 1845 on "hermetically sealed tomatoes," and which contains the following: "This is prepared by straining the skins and seeds from the tomatoes, evaporating the particles by slow heat. The bottles contain the substance of about two dozen tomatoes, and it will keep good any length of time." The style of the label is in marked contrast to those now in use. In 1847 Harrison W. Crosby, when he was steward of Lafayette College, at Easton, Pa., first used tin cans to seal tomatoes hermetically, and in 1893 the canning of corn was begun by two firms, one in Baltimore, Md., and one in Portland, Me. The establishment in Portland gained little headway until 1852, in which year Isaac Winslow, who was in charge, applied for a patent on his process, but which was not granted him until 8 April 1862. His method was substantially the same as the Appert process, with the exception that the first cooking was done away with by the introduction of "cookers," which are steam retorts used to cook the corn before placing it in the can. Prior to 1846 numerous canneries were in operation in New York, Boston, Baltimore, Portland and Eastport, Me., and in Newark, N. J., and it was in the latter place that the fruits and vegetables were prepared for Kane's Arctic Expedition.

In 1860 factories began to spring up in all the great fruit and vegetable raising sections of the country. The Middle West loomed up as a manufacturing centre. Thomas Duckwall erected the first canning factory in Claremont County near Cincinnati, and Albert Fisher followed at Cincinnati. A few years later a cannery was started at Circleville, Ohio, and at Indianapolis, Ind. From that time up until 1880 factories sprang up all over the Middle States like mushrooms.

California then began to be heard of, and rapidly came to the front as a producer of canned fruits, now being in the lead in the preserving and canning of small fruits, such as the plum, pear, peach and cherry, and such vegetables as asparagus, tomatoes and peas. The dried fruit industry, in which prunes and raisins lead, and which has reached its fullest development in California now exceeds in volume the production of canned fruit.

The canning of fruits and vegetables has grown more rapidly in the last 30 years than any other branch of the industry, due to the greater territory in which it may be carried on and to the unlimited cultivation of these articles. The canned vegetable branch of the industry yielded products of $29,000,000 in 1899, $53,000,000 in 1909, and $84,000,000 in 1914. The dried fruit production of 1909 was $22,000,000, and about $35,000,000 in 1914.

The tomato has proved the most popular of canned vegetables, and the manufacture in 1909 was valued at $18,747,000, rising to $25,532,000 in 1914. Corn and peas represented a value of about $15,000,000 each, and beans $16,500,000. Of fruits, peaches now lead, apples having fallen into fifth place. Of dried fruits, raisins and prunes are far in the lead. In 1915 leading canneries contracted for the largest acreage recorded to that date — 190,106 for sweet corn, 140,000 for tomatoes and 102,000 for peas, this last figure being a reduction from the 1914 acreage, contracted for, of 126,000.

Fish.— All the known processes are used in the preservation of fish, which of all foods is the most rapid to putrefy. Smoking and drying are the older methods, and they are still in use. The Hollanders put up fish in cans long before the Soddington and Appert methods were known. About 1845, sardine canning was successfully established on the coast of France. Prior to 1843 the canning of fish in the United States was little known, but in that year lobster and mackerel canneries were successfully established at Eastport, Me., and the business grew rapidly till 1860, when the supply of lobsters decreased and the prejudice against the canneries resulted in the enactment of strict laws restricting the time of operation of canneries and the canning of short lobsters, so that in 1895 the last factory so engaged suspended, and in 1900 there were no lobsters canned. Mr. Underwood established the first lobster-packing factory in this country at Harpswell, Me., in 1848, and in 1853 started a factory for packing salmon at Bathhurst, N. B., at one time the only source of supply. Quantities of this fish were sent to California prior to salmon being taken from the Columbia River. He died in 1864, and was succeeded by the firm of William Underwood Company, of which his grandson, H. O. Underwood, is president. Prior to 1864 salmon-canning was carried on to a small extent, but after that year the industry grew rapidly; factories were established on the Pacific Coast at Washington, Cal., on the Sacramento River, and in 1866 on the Columbia River. Perhaps the most striking illustration of the growth of this business is in that almost universally used article, canned salmon. In 1864 the firm of Hapgood, Hume & Company, consisting of William Hume, G. W. Hume and A. S. Hapgood, canned a few cases of salmon on the Sacramento River, where William Hume had been a hunter and fisherman for several years. William Hume carried the samples around to introduce them, using a basket for that purpose, from which the salmon were sold. In 1866 the business was transferred to Eagle Cliff, Wash., on the Columbia River, where William Hume had been prospecting the year before, and there (in 1866) the first Columbia River Royal Chinook salmon were packed, thus introducing to the trade what is unquestionably the finest food-fish known. That year they packed about 4,000 cases of 48 1-pound cans each, or 192,000 cans. Most of this was shipped to Australia, selling at about $4 in gold (which was at a heavy premium at that time), and a small amount was shipped to New York, around Cape Horn, bringing $5 per dozen there at wholesale. In 1883 there were in Alaska 5 canneries, which in six years increased to 37 with an output of 714,196 cases.

Next in importance comes the sardine canning of Maine, which did not come to a point of success until 1875, and this branch of the business outranked all others. The process of putting up fish is extensive and complicated, and since the beginning of the industry many changes have been made, more especially in the time allowed for cooking, softening the bones of the fish, and in filling, capping, labeling and boxing the same. Up to 1880 the business done in this line was very small, but gradually grew after that, and the establishments at Eastport, Robinson, Lubec, Jonesport, East Lamoine and Camden, all in Maine, are now thriving.

Besides the fishes named, smelt, sturgeon, menhaden, halibut, Spanish mackerel, eels and herring are put up in large quantities. The canning of fish is generally divided into five classes: (1) Those plain boiled or steamed, which include salmon, mackerel, halibut, lobsters, etc.; (2) those preserved in oil, of which sardines constitute the major portion; (3) those preserved with vinegar, sauces, spices, etc., among which are herring, eels and sturgeon; (4) those cooked with vegetables, namely, fish chowder, clam chowder and codfish balls; (5) those preserved by any other process, such as smoking and salting, and which are put into cans for convenience. Smoking and salting of fish is principally confined to the Eastern States lying along the Atlantic Coast, although the industry is carried on to some extent in the Pacific States.

In 1855 one-pound lobsters sold at $2.75 and salmon at $4 a dozen. No one believed him when William J. Underwood made a prediction that the prices of salmon and lobsters would cross each other during his generation, the lobster tending upward and the salmon dropping down, a situation which has come about even earlier than he anticipated.

The canned fish production of 1909 was $14,500,000; smoked fish $3,000,000, and salt fish $7,000,000. In 1914 the total canned fish production rose to $19,000,000; smoked fish fell off to $2,760,000 and salt fish increased to over $8,000,000.

Oysters and Clams.— The oyster is a lamellibranch or bivalve mollusk of the genus *Ostræa*, the most important in commercial value to be found in American waters being *Ostræa virginiana*, which are generally found attached to some solid substance in the brackish waters at the mouth of rivers or in the shallow waters along the seacoast, the depths of the water in which they lie varying from 15 to 180 feet, according to temperature. The principal and most productive beds in which they were found in the early history of the industry were in Chesapeake Bay, Cape Cod and Long Island Sound, but the constant fishing up to 1860 soon depleted these, and the supply in the public beds along the coast of Connecticut, New York, New Jersey and Delaware would have been exhausted long ago but for the systematic breeding and cultivation of this succulent bivalve. Maryland, Louisiana, California, Mississippi and South Carolina are now the chief sources of supply.

The canning of oysters has grown simultaneously with the canning of fish, and the two were generally carried on, in the early days of the industry, under the same roof. Thomas Kensett was probably the pioneer of oyster canning, and commenced operations in Baltimore as early as 1820, later being followed by others, but it was not until 1850 that the industry was put on a permanent basis. Originally, the oysters were opened by hand, but Louis McMurray, of Baltimore, introduced, in 1858, a new method, that of scalding the oysters before removing the shells, and this method made the removal of the oyster from the shell much easier. Two years later steaming took the place of McMurray's method, and this process consisted of placing the oysters in baskets having a capacity of three pecks or more, and then putting these baskets into a box through which steam was passed. In 1862 Henry Evans introduced the method of "shucking," his process being as follows: The oysters were placed in cars of iron framework, six to eight feet long, which held about 20 bushels of unshucked oysters; the cars were then run on a track from the wharf to an air-tight and steam-tight box; after steaming for about 15 minutes, the cars were run into the shucking shed and opened; after shucking they were washed in cold water, packed in air-tight cans, hermetically sealed and weighed; the cars were then run on a track to a steamer and treated to a sufficient degree to kill all germs of fermentation, and then cooled off in a vat of cold water. The total cost of handling a bushel of oysters by this method was estimated at 29 cents. In canning the variety of oysters found in the Gulf of Mexico, the following process was introduced in 1880 by William T. J. Mayburg: "To 10 gallons of pure water add one-half gallon of good commercial vinegar and one-tenth gill of a saturated aqueous solution of salicylic acid, to which mixture sufficient common salt is added to impart the requisite salty flavor to the oyster. The mixture is boiled a few minutes and poured over the oysters in the cans, which are at once sealed and placed in a steam bath, the temperature of which is 202° F. This temperature is gradually raised to 240°, and maintained at that degree for about 40 minutes. The cans are then vented, resealed and steamed as before for about 30 minutes, after which they are ready to be labeled and packed."

It seems rather extraordinary, but in 1850 oysters were packed in Boston, which found a ready sale in direct competition with Baltimore goods, and for a number of years there was considerable rivalry between the two markets. The oysters were brought from the coasts of New Brunswick and Prince Edward Island, and were said to have a finer flavor and to keep much better than those from the warmer waters of the South. They were packed in one- and two-pound canisters, and large sales were made in Saint Louis at $4 and $7.50 per dozen. The canned oyster production of 1909 was valued at $2,443,000, and clams at $402,000. In 1914 the figures increased to $2,677,000, and $670,000.

Pickles, Preserves, Jellies and Sauces.— This important branch of the industry is of more recent development. It can hardly be called canning because most of it is put up in glass. The methods of cooking and preserving are very similar. The trade consists mainly of branded goods whose sale is created and maintained largely by advertising. The brands are put up attractively, trade marks are used to protect them, and notwithstanding criticisms of pure food agitators, they have moved steadily forward in popular favor. The goods packed in glass are more liable to contact with the air, and therefore the manufacturers have depended more on artificial preservatives, of which benzoate of soda is the most common. The difficulties of making the goods keep and of avoiding harmful preservatives seems to have been met successfully, as shown by the vast sale. In 1909 the total for pickles, preserves, jellies and sauces was $48,500,000, and in 1914 the estimated figure was $66,000,000 worth.

Canning Tools and Processes.— In 1876, at the Centennial Exposition in Philadelphia, the Ferracute Machine Company, of Bridgeton, N. J., displayed a collection of tools for making cans and canners' goods, and immediately thereafter secured large sales. To Oberlin Smith, president of the concern, and also for a time president of the American Society of Mechanical Engineers, must be given a great deal of the credit for supplying canneries with simple and inexpensive machinery. A line of presses was marketed for stamping out the tops and parts of cans of all sizes; gasoline firepots were made for heating the capping steels and tinning-coppers, or tools for closing the cans. These fire-pots were provided with air-pumps for driving air into the gasoline tanks and thus forcing out the oil, which was vaporized by the heat and burned as a gas under the pot. These pots for heating the soldering tools are designed to stand on the capping-tables where the tops of the cans are soldered. Among special machines made for the canner are hulling machines with a capacity of 1,000 bushels of peas in 10 hours, and rotary separators that grade the peas into sizes at about two-thirds this speed. There are also pea-sieves for sorting peas in small quantities, and pea-blanchers for scalding and blanching peas. There are corn-cutters on the market with a capacity of 4,000 ears an hour, and corn-silking machines for removing the silk and refuse from the corn. Many automatic can-filling machines will handle 1,200 cans an hour. There is a great variety of machines for handling the different fruits and vegetables, as well as numerous parers, graters, corers and seeders.

In canning fruit, steam-boilers are necessary to supply the various tanks and kettles, which are used in washing and scalding. Baskets of heavy galvanized wire are used for handling tomatoes and various fruits when dipping into the scalding kettles. For steam-cooking a common method is to fill a large wire tray with filled cans which have been capped but not wholly closed, a vent being left for the escape of air and steam. Immediately after cooking, while yet hot, this vent is sealed with a drop of solder, so that the destructive germ has no chance to enter. Salmon is cooked and sealed afterward in the same manner.

Statistics.— California is now the leading State in the canning and preserving industry. Her production increased 120 per cent in the decade ending in 1909, in which latter year over $33,000,000 worth of goods, mostly canned fruits, were placed to her credit, this being 20 per cent of the country's total. New York was the second State, with $19,000,000 production, and Maryland has fallen to third place with $14,700,000. Washington advanced from 13th to fourth rank with a production of $9,600,000, a gain of 88 per cent; Pennsylvania continued the normal output of $9,500,000; Indiana developed wonderfully, showing $8,758,000, a gain of 158 per cent. The other States of large production are Maine, Illinois, Massachusetts, Michigan, Wisconsin, Ohio and New Jersey. Of these, Wisconsin is making the most rapid progress, showing an advance of 253 per cent in the census period. There is really only one State that shows a considerable falling off in canning, Mississippi, where the fish and oyster industry has decayed.

The average number of people employed in canning and preserving in the United States is 72,000, but this is a very variable figure, because canning is largely a seasonal business. Only 20,000 people find employment in January, while the demand from July to October runs from 100,000 to 155,000, September being the busiest month. Nearly one-half of the employees are women and children, but the proportion of men increases, and the disposition to employ children diminishes.

A total of $119,000,000 capital is invested in the industry; the earnings are nominally $235,000,000, but subtracting the cost of the materials, the real income being the value added by manufacture, gives about $85,000,000 as the real measure of the industry annually.

CHARLES H. COCHRANE,
Author 'Modern Industrial Progress.'

CANNIZZARO, kän-nē-tsä'rō **Stanislao**, Italian chemist: b. Palermo, 16 July 1826; d. 1910. He studied medicine at Palermo, and chemistry at Pisa. In 1848 he was a member of the Sicilian Parliament and had part in the revolution in Sicily. In 1852 he became professor of chemistry in Alessandria; in 1857 in Genoa; in 1860 in Palermo; and in 1870 in Rome. He emphasized by clear definition the difference between atomic and molecular weights, and was one of the most influential in establishing Avogadro's law as a maxim of chemical science. He also discovered benzyl-alcohol and cyanamide. He wrote 'Sunto di un Corso di Filisofia Chemica, e Nota Sulle Condensazioni di Vapore' (1880); 'Relazione Sulle Analisi di alcune Acque potabili' (1882); and 'Abriss eines Lehrganges der theoretischen Chemie,' which appeared in Ostwald's 'Klassiker der exakten Wissenschaften.'

CANNOCK, England, an urban district and parish in West Staffordshire, eight miles north-northwest of Walsall, in the district known as Cannock Chase, which is rich in coal and ironstone. Manufactures of boilers, edge-tools, bricks and tiles are carried on, and there are numerous collieries. Pop. (1911) 28,586.

CANNON, Annie Jump, American astronomer: b. Dover, Del., 11 Dec. 1863. A student at Wellesley College, she was engaged in 1897 as staff assistant in Harvard College observatory and in 1911 became curator of astronomical photographs. During her photographic work she discovered three new stars, one spectroscopic binary and 150 variable stars, and completed a voluminous bibliography of variable stars with 45,000 references. She also wrote 'Second Catalogue of Variable Stars' (1907); 'Maxima and Minima of Variable Stars of Long Period' (1909); and 'William Paton Fleming' (1911).

CANNON, Frank Jenne, American politician, son of George Q. Cannon (q.v.): b. Salt Lake City, Utah, 25 Jan. 1859. He was graduated from the University of Utah in 1878, and in the same year engaged in the printing business, acquiring interests also in western mining enterprises. He was a delegate to the Republican National Convention in 1892 and 1896, and a delegate to Congress from the Territory of

Utah in 1895. In 1896, against the wishes of the Mormon leaders, he became candidate for and was elected to the United States Senate, serving until 1899. As a result of political differences, he separated himself from the Mormon Church and, joining the Democratic party in 1900, was State chairman from 1902 to 1904. He became managing editor of the *Rocky Mountain News* and contributed articles on political subjects to magazines. He has published 'Under the Prophet in Utah,' with Harvey J. O'Higgins (1911), and 'Brigham Young and the Mormon Empire' (1913). Both works are exposés of conditions in Utah under the Mormon domination.

CANNON, George Quale, American politician: b. Liverpool, England, 11 Jan. 1827; d. Monterey, Cal., 12 April 1901. He went with his parents to Nauvoo, Ill., in 1844, and was one of the earliest settlers in Salt Lake City. He was a member of the legislative council of Utah in 1865–66 and 1869–72, and was a delegate to Congress from 1872 to 1881, where he was seated only after a long fight against him on the ground that he was a polygamist. At a Constitutional Convention at Salt Lake City in 1872 he was chosen to present the constitution and memorial to Congress for the admission of the Territory into the Union as a State. He translated the 'Book of Mormon' into the Hawaiian language. He held various positions of importance in the Church, including that of first councillor after 1880, and wrote a number of pamphlets in support of Mormonism, and a biography of Joseph Smith (1888). His son, Frank J. Cannon, was elected one of the first two United States senators from Utah in 1896.

CANNON, Henry White, American bank president: b. Delhi, N. Y., 27 Sept. 1850. He was educated at Delaware Academy in his native town and engaged in banking. He was comptroller of the currency, 1884–85, and was a member of the International Monetary Conference at Brussels in 1892. He is a director of several important railroads and of the Manhattan Trust Company, and was president of the Chase National Bank in New York, 1886–1904. He is vice-president and director of the United States Guarantee Company, and of the Brooklyn Union Gas Company.

CANNON, James Graham, American financier: b. Delhi, N. Y., 1858. A brother of Henry White Cannon (q.v.), besides being director in several banks and influential corporations, he was for some time president and director of the Fourth National Bank of New York. He is author of the standard work 'Clearing Houses; Their History, Methods and Administration' (New York 1908), and of an address 'Clearing Houses and Currency' (1913).

CANNON, Joseph Gurney, American politician: b. Guilford, N. C., 7 May 1836. Admitted to the Illinois bar, he was State's attorney of Vermillion County, 1861–68. He was a member of Congress from 1873 to 1891, and again, 1893–1903. He was 20 years on the Committee on Appropriations, and its chairman in the 55th and 56th Congresses. He was speaker of the House of Representatives in the 59th and many succeeding Congresses. His autocratic power was greatly limited by the House resolution of 19 March 1910, enlarging the Committee on Rules and taking its appointment from the speaker and giving it to the House. In 1911 Champ Clark, Democrat, succeeded him as speaker, and in 1912, he failed of re-election as representative but was elected from the 18th Illinois District to the 64th Congress (1915–17). He was a leader of the reactionary branch of the Republican party, to whose methods the downfall of the party in 1912 was generally attributed.

CANNON, William Austin, American botanist: b. Washington, Mich., 23 Sept. 1870. He studied at the University of Michigan and at Columbia University and from 1903–05 was resident investigator at the Desert Laboratory. He became staff member in 1905, and 1911–12, was acting director of the department of botanical research of the Carnegie Institution. He is author of 'Studies in Plant Hybrids' (1903); 'Studies in Heredity as Illustrated by the Trichomes of Species and Hybrids of Juglans, Œnothera, Papaver and Solanum' (1909); 'Root Habits of Desert Plants' (1911); 'Botanical Features of the Algerian Sahara' (1913).

CANNON. See ORDNANCE.

CANNON-BALL TREE, a large tree (*Couroupita guianensis*) of the family *Lecythidaceæ*, a native of Guiana, with a hard, woody, globular fruit six or eight inches in diameter — whence the popular name of the tree. It has large white or rose-colored flowers growing in clusters on the stem and branches. The pulp of the fruit is pleasant to eat when fresh.

CANNSTADT, kän'stạt, **CANNSTATT,** or **KANSTATT,** Germany, town in Würtemberg, in a beautiful and fertile district on the Neckar, two miles northeast of Stuttgart with which it was incorporated in 1905. Its antiquity is proved by the Roman remains found. It has celebrated and much-frequented mineral springs. The Neckar is here crossed by three bridges. The newer portion of the town is well built, with handsome streets and pleasant recreation grounds. Overlooking the Neckar, near by, is the castle of Wilhelma. Of late years Cannstadt has entered to a considerable extent into industrial pursuits, and has railway shops, and flourishing manufactures of machinery, cooking utensils, woolen goods, furniture, electrical supplies, etc. It suffered much during the Thirty Years' War and through the repeated invasions of the French. It was the scene of the victory of the French under Moreau over the Austrians under Archduke Charles, 21 July 1796. Pop. 26,497. Consult Beck, 'Cannstatt and the New Neckar Bridge' (Cannstatt 1893).

CANO, kä'nō, **Alonzo,** Spanish painter, sculptor and architect: b. Granada, 19 March 1601; d. 5 Oct. 1667. When quite young he went to Seville, where he studied both painting and architecture, and at Madrid in 1637 he became intimate with Velasquez who helped him in many ways, among others by introducing him at court where he became a court painter in 1639. He was forced to leave Madrid in 1644 because he was suspected of having murdered his wife; and he went to Valencia. He returned to Madrid and was there subjected to the rack. But his innocence being proved he went to Granada where he spent the rest of his life and where he was made a canon, and chief architect of the cathedral, to which he devoted much of his attention, carving statues and painting pictures for it. He became so distinguished in each of these arts that his countrymen called him the Michelangelo of Spain, although the title is due more to his versatility than to any resemblance in points of genius to the great Florentine. His 'Conception of the Virgin,' in the church of San Diego, at Granada, is considered his masterpiece. His works in sculpture and architecture are numerous. Among the best of these works are his series of pictures 'The Seven Joys of the Virgin,' his busts of Adam and Eve and his various statuettes of the Virgin. In carefulness of design and in the execution of his work Cano ranks high; but in the mastery of coloring he is inferior to the really great artists of his day. His contemporaries ranked him with Velasquez, but time has not sustained this verdict.

CANO, Juan Sebastian del, Spanish navigator: b. Guetaria, about 1460; d. on the Pacific, 4 Aug. 1526. He was one of the first to circumnavigate the globe (1522), as captain of one of Magellan's fleet, which he afterward commanded. In 1525 he was placed second in command of a similar expedition and became its commander by the death of Loaisa.

CANO, Melchior, Spanish theologian: b. Tarancon 1523; d. Toledo, 30 Sept. 1560. He was a member of the Dominican order and an opponent of the Jesuits. He was professor of theology at the universities of Alcantara and Salamanca, and was made bishop of the Canaries, but did not live in his see. He wrote 'De Locis Theologicis' ('On the Source of Theological Knowledge' 1563) and many other theological works. He was sent as the representative of the Crown to the Council of Trent in 1551 to maintain the court theological traditions. His complete works were published at Padua in 1720.

CANOE, ką-noo', a light boat designed for propulsion with a paddle or paddles. The term is very commonly used to designate the small vessels used by uncivilized people living near the water. The name is of West Indian origin, the Carib word being *canáoa*. Canoes are built in divers forms and of various materials. The primitive canoes were light frames of wood over which skins or barks of trees were stretched. The most common form was the hollowed tree-trunk; the excavation, before the advent of adequate cutting-tools, being accomplished by means of fire. This form is of wide distribution, being found in Africa, South and Central America, China and the islands of the south Pacific and Indian oceans. In the form known as a "dugout" it is common in the United States. Among the island races of the Pacific the stability of the canoe is largely increased by the adoption of an outrigger, which, of varying forms, prevents capsizing on the one side by its weight and leverage, and on the other by its buoyancy. Many of these islanders sew planks together to form their canoes, making the joints water-tight by means of gums, etc. Others use double canoes united by a strong platform. Such a vessel is capable of carrying a number of persons and a considerable lading. In South America, where large trees are abundant, very large canoes are constructed. The same is true of Africa, where the war-canoes of the native kings carry very large crews. They are often fantastically carved and ornamented.

As stated above, the propelling force of the canoe is usually the paddle, but sails are often used, particularly on sea-going craft.

The Esquimaux canoe is known as a *kayak*. This consists of a light wooden or bone frame covered with seal-skins sewed together with sinews. The skin covering extends across the top, forming a water-tight deck with but one opening amidships to admit the boatman. A hoop is fitted to this opening, and after the boatman has entered he fastens himself in by means of an apron so that the whole boat is water-tight, and he becomes, as it were, part of the craft. So intimate is this union, and so skilful are the Esquimaux in the management of their kayaks, that the boatman can with a twist of his paddle capsize the craft and turn completely around under water, coming up again on the opposite side to that he went over. The paddle is about 10 feet long and double-bladed. The *oomiak*, or women's boat, is also made of seal-skins sewed over a framework; but it is of large, even clumsy build, and but for its propulsion by paddles might be classed as a boat rather than as a canoe. It is designed as a transport for women, children and household goods rather than for the chase, for which the kayak is principally used.

The Aleuts build large skin boats, somewhat resembling the Esquimaux oomiak, which are propelled by paddles. Such a boat is known as a *bidarkee*. Other tribes of the west coast build large canoes of wood, the war-vessels being, like those of Africa, curiously decorated.

A peculiar form of canoe is found in the Kootenai district and on the Columbia River. While most canoes are constructed with the bow and stern either perpendicular or with a flaring overhang, these Kootenai craft are shaped, both at bow and stern, like the ram of a warship. In other words, the greatest length is along the bottom. These canoes are generally about 15 feet long and are constructed with a light framework of cedar covered with spruce or white-pine bark. This bark is cut off in one piece in the spring, when the sap is running, and is turned inside out, bringing the smooth side in contact with the water. The canoes are sewed with rawhide or tendons, and cracks and knot-holes are stopped with resin. Two squaws will make a canoe in four or five days; the chief difficulty being to get the bark off whole and to turn it wrong side out successfully.

The North American Indians have brought the canoe to its highest state of perfection. With the most frail material, birch bark, they construct a craft so light that it may be carried by one man, and yet so strong and buoyant that it will carry a very considerable load. A framework of light but tough wood is covered with sheets of birch bark, which are sewed together, the seams being waterproofed with resinous gums. They are propelled by means of a single-bladed paddle, which is dipped on one side only (a slight twist correcting the tendency to swerve from a straight line), or alternately on either side. The use of the birch-bark canoe by the Indians of the United States is rapidly becoming a thing of the past; but the art of building them has been preserved by their construction as pleasure-craft.

A form of canoe of recent invention is used solely for pleasure. About 1865 John MacGregor, impelled by a love of adventure, sought recreation on the rivers and fjords of Europe as well as on the waters of Egypt and Palestine. He developed his model from the Esquimaux kayak, and evolved a clinker-built craft of cedar, about 14 feet long and 2 feet in beam, depth 10 inches to 16 inches, entirely decked over with the exception of a «well» in which the canoeist sits. This is propelled by means of a double-bladed paddle, but a short mast enables the carrying of a sail. In a canoe of this type, which he named the *Rob Roy*, MacGregor cruised on the Danube, the Jordan, the Nile, the Seine and on Norwegian fjords. From this early model other forms have been evolved, notably the Nautilus and Shadow types. Water-tight compartments ensure permanent buoyancy. Centre-boards counteract leeway when under sail on a wind. The interior space is so arranged as to provide a sleeping-place for the cruiser.

There are many canoe clubs in the United States, England and Canada, and the canoe may be seen on all the coastwise and inland waters of those countries, as well as on the continent of Europe. Consult MacGregor, ‹A Thousand Miles in the Rob Roy Canoe› (1866); ‹The Rob Roy on the Baltic›; Powell, W. B., ‹Canoe Traveling› (1871); Alden, W. L., ‹Canoe and the Flying Proa› (New York 1878); Hayward, T. D., ‹Camping out with the British Canoe Association›; Vaux, C. B., ‹Canoe Handling› (New York 1888); Stephens, ‹Canoe and Boat Building› (New York 1881); ‹Canoes and Canoeing,› ‹Spalding's Athletic Library› (New York, annually).

CANON, kä'nŏn, Johann, Austrian painter: b. Vienna, 13 March 1829; d. there, 12 Sept. 1885. He studied with Rahl, but imitated the old masters more closely. He entered the Austrian army and in 1848–55 was lieutenant of cuirassiers, but even while in the army had given much attention to painting and finally devoted his whole time to it. His name first became known through his picture ‹The Fishermaiden,› exhibited in 1858. His work includes genre pictures, historical paintings, and portraits; the latter are thought to resemble Rubens or Van Dyck in style. Among his other paintings are ‹Cromwell Beside the Corpse of Charles I›; ‹The African Lion Hunt›; ‹Flamingo Hunt›; and the ‹Fish Market.› His decorative paintings are in Vienna, Karlsruhe and New York. There is a monument dedicated to him at Vienna. Consult his obituary in ‹Zeitschrift für bildende Kunst› (1886).

CAÑON. See CANYON; GRAND CANYON.

CANON (Greek, a rule, measure or standard). 1. *In the arts.*— When art has succeeded in producing beautiful forms the question arises, with what proportions beauty of form is united. Artists of genius first started this question, and imitators, inferior to them in talents, scrupulously followed their results, and naturally exalted some existing work into a model for every performance. Among the Greeks the celebrated statuary Polycletus (452–412 B.C.) first instituted such inquiries; and as he generally represented youthful, pleasing figures, it is probable that he fixed the standard of beauty in the youthful form. The canon (the model statue) of Polycletus was accordingly a statue which was made principally for the purpose of showing the beautiful proportions of the human form in a youth just ripening into manhood. No copy of it is known to exist; the artist probably gave his model of proportion a quiet, simple attitude, without any strong distinguishing marks. His successors imitated it without deviation. Polycletus was not the only Greek artist who pursued such investigations respecting the proportions of form. Among the moderns, Dürer and Leonardo da Vinci have devoted themselves to similar inquiries.

2. *In Scriptural literature,* a term employed to designate the collection of books containing the rule or standard of primitive Christianity; that is, the canonical books of the Holy Scriptures. The canon of the books of the Old Testatment, as contained in the Hebrew Bible, receives in this form equal respect among all Christians, because Christ and the apostles have expressly appealed to them, and in this way pronounced them writings inspired by God. There are certain books, however, belonging in subject to the Old Testament, but whose canonical character the Jews did not acknowledge, and which Protestants class together under the head of Apocrypha, and reject from the canon. For these there is only a Greek, and not a Hebrew, text. The Western Church accepted them as canonical in the African council, about the end of the 4th century; but the opinions of the clergy respecting them remained for a long time divided. Saint Jerome denied their canonicity, and many theologians coincided with him. The Roman Catholic Church finally declared them canonical in the Council of Trent. (See APOCRYPHA). Respecting the number of books belonging to the canon of the New Testament, the opinions of Christians were much divided till the 6th century. As early as the 2d century the separation was made into the Evangelicon (the four Evangelists) and the Apostolion (the Acts and Epistles of the Apostles). The five historical books, the Epistles of Paul, the First Epistle of Peter, and the First Epistle of John were universally acknowledged to be genuine in the 3d century; hence Eusebius, in his ‹Ecclesiastical History,› written about 325 A.D., calls them *Homologomena* (universally received). The other five Catholic epistles (Second of Peter, Second and Third of John, Jude and James) he calls *Antilegomena* (doubtful, not universally received). At that time the Epistle to the Hebrews was considered genuine by most persons, and the Apocalypse by many. These books were received in the second half of the 4th century in the Egyptian Church (where Athanasius first used the term canonical), and in the Western Church. In the Eastern Church, properly so called (the dioceses of the patriarchs of Constantinople, Antioch and Jerusalem), only the Catholic epistles were of canonical authority at that time; the Apocalypse not till the 6th century. The canon of the New Testament has since remained unaltered, and the Protestant churches hold it in common with

the Greek and Catholic churches. The results of critical examinations of the genuineness and canonical character of the single books of the Bible, even when they were unfavorable to the books, have produced no alteration in the established canon. The reasons of the ancient fathers of the Church for or against the canonical character of the biblical books were merely historical and traditional, and built on philological criticism; they are still the most tenable and rational; the philosophical grounds are more subject to be affected by extraneous influences. For bibliography see Bible.

3. *In ecclesiastical use,* a rule or law of doctrine or discipline as established by ecclesiastical authority. The term is further applied to various matters of church organization and ceremony; also to books containing the rules of religious orders, etc., and to a list or catalogue of acknowledged and canonized saints in the Roman Catholic Church.

Another distinctive ecclesiastical use of the term is that which designates a dignitary possessing a prebend, or revenue allotted for the performance of divine service in a cathedral or collegiate church. Canons were originally priests who lived in community, appointed to assist the bishop in his duties, and supported by the revenues of the bishopric. Secular canons are those who, in progress of time, have left off the custom prevalent in monasteries of living a community life, and have the privilege of enjoying the returns of their respective benefices. The obligations of the canons are contained under three heads: (1) The duty of residing in the place where the church they belong to is situated; (2) assisting at the canonical offices which are celebrated in the church; and (3) attending the meeting of the chapter at the appointed times. They cannot be absent from their benefices for a longer period than three months, and are obliged to sing or recite their office in choir. In their collective capacity they are called a chapter, and form the council of the bishop. In each chapter there are dignitaries. The name was originally applied to all the clergy, but was afterward confined to those who were connected with the cathedral church, or to specially privileged churches.

4. *In music,* with the ancient Greeks, the term canon signified what now is called monochord. At present it signifies a composition in which the several voices begin at fixed intervals, one after the other, and in which each successive voice sings the strain of the preceding one. In Italian, therefore, it is called fuga di conseguenza; in Latin, canon perpetuus, or continuous fugue; in German, Kreisfuge (circulating fugue). Sometimes each voice begins with the same, sometimes with different notes. The phrase or passage for imitation is called the theme or subject, the imitation, the reply. Canons may be finite or infinite. The former end, like any other compositions, with a cadence, while the infinite canon is so contrived that the theme is begun again before the parts which follow are concluded. A canon may consist of two, three, four or more voices. Canons differ from ordinary fugues; for, in the latter, it is sufficient that the subject be occasionally repeated and imitated according to the laws of counterpoint; but, in the former, it is essential that the subject be strictly repeated by all the succeeding parts; which repetition may be made in the unison or octave, the fourth, or the fifth, or any other interval of the scale. There are several other canons, as canon polymorphus, canon per diminutionem and canon per augmentationem. Sometimes, also, a musical passage of a composition in which one voice repeats for a short time another is called, improperly, a canon. Consult Ouseley's 'Treastise on Counterpoint, Canon, and Fugue' (1869).

5. *In printing,* canon is the name given to a large type which is so called from the early use of it for printing the canon of the mass and the Church service-books.

CAÑON CITY, Colo., a city and county-seat of Fremont County, situated on the Arkansas River, near the mouth of the Grand Cañon, and on the Denver and Rio Grande, and the Atchison, Topeka and Santa Fé railroads. It is a well-known health resort, over 5,000 feet above the sea-level, with an excellent climate and hot and cold mineral springs. It is the seat of the State penitentiary and Odd Fellows' sanatorium and home, an academy for young women, and has a Carnegie library, two hospitals, seven public parks and a hot-water natatorium. The city has abundant water power, with an excellent gravity system; the soil is fertile, and in the vicinity are rich deposits of iron, coal, silver, copper, marble, limestone and petroleum. Fruit growing is an important industry, and there are canning and brick and tile factories, a large smelter and a reduction mill. Pop. (1910) 5,162.

CANON FINCH, TOWHEE, WREN. See Finch, Towhee, Wren.

CANON LAW. Canon law is so named because it consists of rules or canons, which are established to guide the faithful to eternal happiness. In a strict sense, canon law comprises only those laws which emanate from an ecclesiastical authority that has supreme and universal jurisdiction. In a wide sense, it takes in also those laws enacted for the good of the faithful by anyone having ecclesiastical authority. The sources or fountains from which canon law has originated are sacred Scripture; divine tradition; laws made by the Apostles; teachings of the Fathers; decrees of the sovereign pontiffs; ecumenical councils; certain congregations of cardinals under orders of the Pope; custom, which, however, could in no case be contrary to divine law, common sense, good manners, public order or the spirit and the rights of the Church. The Old Testament contains three sorts of precepts, moral, ceremonial, judicial. The moral code remains in full force under canon law; the ceremonial and judicial laws have lapsed. The New Testament is the chief source of ecclesiastical law. It contains also dogmas of faith, but with these canon law does not deal except indirectly. By tradition is meant a doctrine not written by its first author, but conveyed by word of mouth. Usually it is subsequently put into writing. Traditions, considered in their source, are divine or human. Divine are those which have God for their author, and which the Apostles received either directly from Christ or by the suggestion of the Holy Ghost. Human traditions are termed apostolic if they originate with the Apostles, or ecclesiastical if they come from the successors of the Apostles, called bishops of the Church. Divine traditions bind all the faithful; human only those of the localities and times to which they are applicable. Some of the enactments attributed to the Apostles are the Apostles' Creed; abstinence from things sacrificed to idols and from blood and from things strangled, part of which prohibition has lapsed; the substitution of Sunday for the Sabbath of the Jews; the institution of certain feast days; the fast of Lent. The sentences of the Fathers, approved by the Church and made into universal laws by councils or the Roman pontiffs, are part of canon law. These sayings were not inserted in the collection of canons before the 6th century, John Scholasticus being the first to do this in the East in that century, and Regino first in the West in the beginning of the 10th century. To the student it is evident that the constitutions or decrees of the Roman pontiffs constitute the chief source of canon law; in fact, the entire canon law in the strict sense of the term is based upon the legislative authority of the Pope. To understand this it is necessary to recall that in the Catholic doctrine all authority in the Church comes from above, not only in the office of priesthood, but also in the matter of jurisdiction or power of ruling. Catholic writers hold that the primacy or headship in the Church was established by Christ in Peter before the priesthood was conferred on him and the other Apostles, the purpose of the Saviour being to effect unity in his organization. The Church thus organized is a spiritual monarchy; elective it is true, but not an aristocracy or democracy. Other religious organizations hold quite the opposite doctrine and would make their unity a coalition of equal parts. This point of primacy of the Roman pontiff is also the line of separation between the canon law of the West and that of the separated Greek and the Russian churches, the review of which is given later in this article. Ecumenical councils, whose decrees are a source of canon law, are those meetings of the bishops of the Church throughout the world, which are held under the presidency of the Pope or his legates, and whose acts are by him confirmed. There are 20 councils recognized as ecumenic; the first being that of Nicæa in 325; the latest that of the Vatican in 1870.

During the first three centuries, the Church was administered according to the Scriptures only and the rules laid down by the Apostles and bishops, as occasion required. Thus Clement, the disciple and successor of Peter, mentions the rule given by the Apostles concerning the succession of bishops, and Ignatius the Martyr, in his epistles, exhorts his followers diligently and tenaciously to observe the traditions of the Apostles. Thus, too, in the controversy concerning the celebration of Easter, the contestants on each side alleged the apostolic tradition. But councils were held at Ancyra and Neo-Cesaræa in 314, at Nicæa in 325, at Antioch in 322, at Sardica in 347, at Gangra from 362 to 370, at Laodicæa between 337 and 381, at Constantinople in 381, at Ephesus in 431, and in the council of Chalcedon in 451 a collection of canons made up from these previous councils was read and partly authorized for the entire Church. With the exception of those of Sardica, which are in Latin, the canons of all these early councils were formulated in Greek. The name of the compiler of this first collection is unknown and few of these early canons have reached our times, only their tenor being known through subsequent use in the Western Church, especially in Spain. After the emperors assumed the Christian religion, ecclesiastical legislation became important, and the laws of the Church were therefore in the year 438 inserted in his collection by the Emperor Theodosius II. Valentinian III afterward adopted this collection for the West. About this time — the latter half of the 5th century — a compilation was made of the so-called apostolic canons and constitutions together with decrees of some of the councils. Originally there were 50 canons called apostolic, but their number was afterward increased to 85, some of which are certainly spurious. In the East these were received as having the stamp of authority, but not so in the West, where their origin was doubted. However, Dionysius adopted the smaller collection of 50, considering them useful for discipline, and thereby without determining their origin procured for them in Rome the stamp of authority. John Scholasticus made a collection of canons for the Greek Church in 564, to which he added 68 canons taken from Saint Basil. He divided the work into 50 titles. To this he later added the laws of the empire which had relation to the laws of the Church, and the new compilation became known as Nomo-canon. The Emperor Justinian II in 692 assembled a council in his palace at Constantinople, called the Trullan council from the room in which it was held, and 102 canons were enacted. When the acts and canons of this council were submitted to Pope Sergius at Rome for approval he refused even though the Emperor ordered his armor-bearer to bring the Pope to Constantinople. The Trullan compilation consisted of the so-called canons of the Apostles, those of the 10 councils previously mentioned, the canons of the synod of Carthage, the decrees of a synod in 394 at Constantinople under Nectarius, the canonical decisions of the 12 eastern patriarchs and of some bishops from the 3d to the 5th centuries, the canon of a council held at Carthage under Cyprian in 256, to all of which were added the 102 canons drawn up by the Trullan council itself. Afterward 22 canons of the second council of Nicæa held in 787 were added. On this foundation the Church law of the East was based up to the middle of the 9th century. By the Trullan synod, priests were allowed to marry, which up to that time was against the canon law of both the Eastern and the Western Church. The Trullan synod also sanctioned the canons of the Apostles, one of which teaches the doctrine of the re-baptisers, which had been previously repudiated by Pope Gelasius. Herein is noticed the first real divergence between Eastern and Western canon law. Photius, who was intruded into the see of Constantinople, called a council against the patriarch Ignatius in 861, and 17 canons made by this council were added to the codex of the Greek Church. He also formulated a new collection, in which the second part, called the Nomo-canon, remained unchanged. The Emperor Leo the Philosopher, who deposed Photius, rescinded his collection of laws, but nevertheless the seeds of the separation of the Greek Church from that of Rome had been implanted by the work, although a complete schism took place only later in 1054 under Michael Cerularius. From time to time new ecclesiastical constitutions issued from the emperors, as from Leo Philosophus in 911, from Constantine Porphyrogenitus in 961, from Alexius Commenus in 1118, from Isaac Alexius in 1185–90. The resolutions of synods summoned by the patriarchs of Constantinople, epistles of renowned bishops and their decisions, formed another addition to the canon law of the Eastern Church. The first commentary on the Greek codex was undertaken by Theodore Prodromos in the 8th century. The second, containing the text with a commentary, is the Nomo-canon of Doropater. The monk John Zonares composed a comprehensive verbal interpretation in 1120, using the collection of Photius as a basis. Fifty years later, Theodore Balsamon made a commentary with a view to practical questions, comparing the canons with the civil law and insisting that Justinian's maxims only applied when conformable to the Basilica. He added many matters not found in the collection of Photius. Epitomes of canon law were composed at a comparatively early period, the author of the first of which appears to have been Stephen of Ephesus in the 5th century. There is a synopsis by Aristenus augmented by Alexius Aristenus in 1160, and another by Arsenius, a monk of Mount Athos, in 1255. Constantine Harmenopoulos in 1350 composed an epitome of the spiritual law in six parts, using, with some omissions, the collection of Photius as altered by Zonares. In order to reduce canon law to a more practical form than it appeared in the collection of Photius and at the same time present a more comprehensive work than these epitomes, Matthæus Blastares drew up his syntagma in 1335, divided into chapters of different lengths and arranged according to the principal word of these rubrics, the numbers of the chapters commencing anew under each letter. Each chapter begins with the ecclesiastical law, followed by the civil law applicable to it, without, however, mentioning the source of the latter. This work came into very general use among the clergy. The collection of Photius and the syntagma of Blastares continued still in use under the Turkish rule and were alike termed Nomo-canon and, metaphorically, the 'Rudder.' The collection and interpretation of Zonares also obtained canonical authority. From these materials many extracts were translated into modern Greek up to the 18th century, and several textbooks composed for the use of the clergy, some of which were printed in Venice. Lastly a comprehensive collection was published in 1800 at the instance of the patriarch and synod. It contains the old Greek text of all the authentic canons of councils since Photius and Zonares, to which are added interpretations of the authentic commentators in modern Greek, especially those of Zonares and Balsamon. In the interpretation, the canons of those fathers are taken into account which had not been confirmed by any general synod, but had obtained a canonical authority. Nothing was inserted from the municipal law works which did not agree with the canons. Several appendices were added, including formulas for ecclesiastical business, and upon these and similar collections is founded the present law of the Greek separate church. The Russian followed the Greek Church in adopting compilations of Church law up to the end of the 15th century. In 1550 certain regulations respecting the jurisdiction of bishops were introduced. Some canonical epistles and rules drawn up at councils are used in addition to the Greek codex, and manuals adapted to the country have been compiled therefrom. Peter the Great in 1721 changed the chief executive authority in the Church from a patriarch into the Holy Synod, by decrees of which the Church to-day is ruled. By an arrangement lately made with the Roman pontiff the bishops and priests under Roman jurisdiction are ruled by the canon law of Rome, subject to the civil laws of the Russian empire, and to prevent complications, Russia, besides a resident minister and two secretaries, has at the Vatican a representative agent for ecclesiastical affairs.

In the Western or Latin Church the canons of Nicæa and Sardica were the only code publicly received up to the end of the 5th century. About this time the Spanish translation of the Greek code was turned into barbarous Latin, and became known as the Prisca. The decretals of the Roman pontiffs were added to the canons of the Greek code, as found in the Prisca, but it seems that Dionysius the Little, about the year 500, was the first to formulate a collection of the councils and the decretals. He had previously made a collection of the concilia for Stephen, the bishop of Dalmatia. The deacon Theodosius later made a new collection founded on the old Spanish and the Dionysian. A third collection termed the Avellanian, valuable for the historical documents it contains, appeared in the latter half of the 6th century. These, however, were superseded by a second edition of Dionysius, made probably in 731 under Pope Gregory II. In this edition some decrees overlooked previously were added, together with an appendix consisting of the statutes of the Roman pontiffs from Linus downwards, those up to Sericius, however, being given only in an historical form as no longer actually in existence. The German conquerors of Italy in 476 did not, although Arian, interfere with the laws by which the Church was governed, but when Justinian reconquered Italy he introduced his Novellæ in the Julian translation in place of the codex of Theodosius II, and this order of things was later upheld by the Lombard kings in their edicts. In Africa the deacon Fulgentius Farrandus made the first collection in 547, termed Breviatio. This was an excerpt in 232 numbers of nearly all the Greek canons, including the Nicæan, to which was added the African concilia under Gratus in 348–49, under Genethlius in 390, and that of Carthage in 419 with its 33 canons, together with 304 taken from synods as well as an extract from the canons framed at Hippo in 393. The second African work was the Concordia of Bishop Cresconius in 690, founded upon the Dionysian, but arranged in 300 titles instead of in chronological order. This work was incorporated with the Dionysian and appeared under the name Breviarium. But the Arabs now put a sudden stop to all further development of canon law in this quarter. As early as the 5th century, as noted above, there was in Spain a translation of the Greek canons; in the 6th century Martin of Braga made a collection of canons, but in the 7th century Isadore of Seville held two councils, half church, half civil, the canons of which may be said almost to have formed the basis of the constitutional law of Spain in both Church and State down to the 15th century. The collection of canons known as Collectio Isadoriana or Hispana was divided into two parts; the first containing the classified series of Greek, African, Frankist and Spanish canons, and the second the decretals from Pope Damasus in 366 to Gregory the Great in 604. In the 5th century an extensive but confused collection of councils and decretals was compiled in Gaul under Gelasius. It was founded upon the old Spanish version and some peculiar version of the canons of Nicæa and the Prisca. Out of it sprung several other collections; the first in the middle of the 6th century, containing the councils of Nicæa, and of Sardica, some Frankist concilia and papal decretals; the second of the same date containing Greek, African and Gallic canons, and papal decretals in a confused order; the third in the 7th century, containing 103 numbers, many decretals, Frankist, Roman and Italian concilia. A fourth and a fifth collection of the same century contained chiefly Frankist and Spanish conciliar decrees. After Charlemagne in 774 on his first visit to Rome had received from Pope Hadrian a copy of the Dionysian collection with some additions, he had it sanctioned in a synod at Aix-la-Chapelle as the *codex canonum* for the Frankist empire. In addition to these principal works many of the bishops composed capitularies for their own dioceses, as Boniface of Mayence, Theodulph of Orleans, Hincmar of Rheims. The 'Hispana' circulated among the Franks in a more or less corrupt form. One edition, which appeared between the years of 829 and 857, has caused great controversy, and is known as 'Collectio Pseudo-Isadoriana,' or False Decretals. The author called himself Isadore Mercator, and the name led many to believe the work that of Isadore of Seville. The best evidence shows that Levites Benedict of Mainz was the compiler, but no purpose for the forgeries in the work has been conclusively shown. After the preface and some minor apocryphal documents, the first part contains 50 of the apostolic canons taken from 'Hispana' and 60 supposed decretals of the Popes from Clement in 92 to Melchiades in 314, arranged chronologically. The second part consists chiefly of canons taken from the 'Hispana.' In the third part, founded also on the 'Hispana,' the compiler has interpolated 35 decretals. A supplement contains some brief regulations regarding processes against bishops, said to be by Capitula Angilramni, a bishop of Metz. The collection was regarded as genuine by all canonists and theologians for 700 years from the 9th to the 15th century. Cardinal Nicholas of Cusa in the 15th century first expressed doubts of the genuineness of some of its contents. In the following century religious bitterness overshadowed scholarly inquiry, but it is now admitted by Protestant writers that the compilation was produced, not in the interest of the Pope but of the Frankist bishops in order to protect themselves against oppression by temporal rulers on the one hand and Church councils on the other. For this reason such insistence is found in the collection on the right of appeal to the Pope in every major cause of a bishop and also that the Pope's permission is necessary to the holding of a provincial synod. The sources from which the compiler chiefly borrowed his materials were the Bible, the Fathers, genuine canons and decretals, Roman law, the works of Rufinus and Cassiodorus on Church history and the lives of the Popes in 'Liber Pontificalis.' Of the supposed decretals a large number are authentic although antedated and ascribed to earlier Popes to give them the value of antiquity, while others embody the traditional contents of actual but lost decretals. The influence of the pseudo Isadorian collection has been much exaggerated, for it wrought no material change either in the faith or the discipline of the Church, since it merely put into enactments the prevailing ideas and doctrines of that period on Church government. Had it introduced a violent change the innovation would have caused a speedy inquiry into the genuineness of the work. However, it cannot be doubted that a written text often in controversy is a more forcible argument than traditional law, and hence the false decretals naturally exerted some influence.

To meet the necessity of rendering canon law more accessible from the 10th to the 12th century at least 36 compilations were made, only the authors, titles and dates of which seem necessary for this article. The first was a manuscript under 12 heads, divided into 354 chapters, abstracted from Cresconius. The second was extracted from Dionysius and the pseudo-Isadore collection. The third is very voluminous, and taken from Hadrian's codex with numerous additions. The fourth, by an unknown author, contains portions of concilia, decretals and extracts from the Fathers. The fifth, made by Regino, abbot of Prum, between 906 and 915, is founded on three Frankist collections, the Fathers and the West Gothic Breviary. The sixth is a Leipzig codex; the seventh a Darmstadt codex. The eighth is attributed to Rotger, bishop of Treves in 922. The ninth is a Viennese manuscript. The 10th is also a manuscript of five books, composed in Italy in the middle of the 10th century, and is founded upon the Irish collection in 65 titles, on fragments of the Fathers, lives of the saints, decretals, Julian's 'Novellæ,' with capitularies of the emperors added up to Henry I. The 11th was addressed by Abbo, abbot of Fleury, to King Hugo and his son Robert, and consists of a treatise of 52 chapters on the Church and clergy. The 12th was composed by Burchard, bishop of Worms, in 1012–23, and contains the canons of the Apostles, the transmarine, German, Gallic and Spanish councils, papal decrees and other passages. The 13th is a manuscript in 12 books made in Germany or France. The 14th is a Terraconian manuscript belonging to the 11th century. The 15th is an introduction to discipline. The 16th is a collection taken chiefly from Halitgar, Rasbanu, Manurus and Burchard. The 17th is a rich collection in manuscript by Anselm, bishop of Lucca in 1086. The 18th is 74 titles taken from the above work, and the 19th and 20th appear about the end of the 11th century, both taken from the works of Anselm and Burchard. The 21st is a work in 13 books. The 22d is the capitularies of Cardinal Atto in 1081 and excerpts from decretals. Cardinal Deusdedit composed the 23d in four books at the end of the 11th century, from Dionysius, the Greek canons, the old Italian and Spanish-Saxon and Roman records. The 24th is by Bourgo, bishop of Satrim in 1089, and is in 10 books. The 25th is in two books and belongs to the 11th or the 12th century. The first chapter is inscribed from the Primate of the Roman Church and is published with the Dionysian collection. The 26th is the decree attributed to Ivo, bishop of Chartres, and the 27th is the Pannormia in eight parts by the same author in 1090. The 28th is a large manuscript collection; first of decretals, second of councils, third of fathers, then Roman and Frankish legal collections. The 29th was made under Pascal II in 1102–18 in seven books. The 30th is attributed to Hildebert, bishop of Tours, in 1134, and may be the same as the 10 books attributed to Ivo. The 31st is a manuscript in 15 books called the collection of Saragossa. The 32d is wholly extracted from the above. The 33d is taken from Burchard and Ivo. The 34th is a penitential book in nine titles belonging to the 12th century. The 35th belongs to the middle of the 12th century and is taken chiefly from Anselm of Lucca and the collection dedicated to Anselmus. Gregory, a Spanish priest, is the author. Lastly, Algerius of Liége in the beginning of the 12th century compiled a work on 'Justice and Mercy,' which contains a treatise on Church discipline in three parts, taken from Anselm and Burchard for the most part. Gratian, a Benedictine monk, composed at Bologna in the middle of the 12th century a scientific and practical work on the canon law with references and proofs. The first part treated of ecclesiastical administration, the second contained 26 legal positions, with their answers, the third part concerned the liturgy of the Church. The whole work is founded on previous collections and contains many mistakes. It was never approved by the Church though it obtained great authority and superseded all other collections. Other collections are by Cardinal Laborans in 1182, that of Bernard of Pavia in 1190, that by Gilbert, an Englishman, in 1203. The universities of Bologna and Paris at an early period began to exercise great influence on canon law and their opinion in controverted questions was considered decisive, and was termed the authority of the schools. Gratian's collection was made the basis of lectures in Bologna and teachers of the canons were called *magistri* and *doctores decretorum*. Their teachings were soon gathered together in books of commentaries. Soon after the collection by Gratian, the Extravagantes, or decrees not yet collected, were gathered together, there being between the years 1179 and 1227 14 different compilations, only five of which received the stamp of authority. Pope Gregory IX ordered a code to be published in which the entire body of law was to be properly arranged. What was useless was to be cut out, what was ambiguous was to be corrected. Raymond of Pennafort was entrusted with this task, which he finished in the year 1233, and the collection was sent to the universities of Bologna and Paris with instructions that it was to be the sole authority. The whole work is divided into five books. The first treats of ecclesiastical judicature and of prelates; the second of civil suits; the third of civil causes before the episcopal forum; the fourth of betrothals and marriage; the fifth of judicial proceedings in criminal matters and of punishments. To these five books was added by Pope Boniface VIII, in 1298, a sixth book of decretals. This was followed in 1334 by the Clementinæ or collection of decretals by Pope Clement V. The Extravagantes of John XXII in 1334 and the Extravagantes Communes (73 decretals from Boniface VIII to Sixtus V) were gathered by authority and made part of the code or 'Corpus Juris Canonici.' Commentaries on the 'Corpus' were made by the doctors, and systematic works for the use of courts were published. In the 15th century legal literature seems confined to these efforts. But in the 16th century Pope Paul IV confided to a congregation of cardinals, with canonists as consultors, the work of revising and correcting the 'Corpus Juris.' Gregory XIII approved the work of the committee and an authentic edition was published in 1580, in which the glosses are retained, and on which all subsequent editions have been based. The corrections made by the commission are marked "*cor. Rom.*" in the text. Two appendices were added, one the Institutiones Lancelotti, the other Septimus Decretalium, which contained the Extravagantes of Sixtus V in 1590. Neither is of public authority, but both are very useful and recognized by scholastic approval. Since then the Bullarium Benedicti XIV, which contains the constitutions of that Pope, has been made of public authority. There is also a collection of papal bulls, called Bullarium Magnum Romanum, made up in 14 volumes, which was published in 1744 and continued in 1840; but it is very imperfect and only a private collection. Anyone who desires to know canon law must learn the 'Corpus Juris,' even though to-day many parts have been changed by the councils of Trent and the Vatican and by new papal decrees. In the 'Corpus' itself the different portions stand as *lex prior* and *lex posterior*, so that in cases of contradiction the latest is preferred. With certain modifications the 'Corpus' still has the force of law in matters relating to ecclesiastical judicature, to divine worship, to doctrine and discipline. It is the code still followed in the schools and used in Church courts, not only as the source of argument but also as the method of procedure in many cases. The 'Jus Novissimum' in canon law consists of laws published from the time the 'Corpus Juris' was closed, that is, since the Extravagantes were inserted down to the present day, and includes the decrees of the councils of Trent and the Vatican. Except the Bullarium of Benedict XIV, mentioned above, no authentic collection has been made of the various constitutions and laws made by the Roman pontiffs since the close of the 'Corpus.' Still every genuine decretal is part of the canon law. The same may be said of the decisions of certain congregations of cardinals which have the force of law, especially that of the council which authoritatively interprets the decrees of the Council of Trent. So evident was the need of a revision of canon law that at the ecumenic Vatican Council, held in 1870, proposals were made by a number of bishops to have a committee appointed, consisting of the most eminent canonists, to revise the 'Corpus Juris' or rather prepare a new one, omitting whatever owing to changed times was no longer applicable. Nothing was done before the adjournment of that council, but Pope Pius X by a *motu proprio* in the year 1904 appointed a special committee of cardinals, with a number of consultors, and a canonist from each nation, to revise thoroughly not only the 'Corpus Juris' but all the canon law of the Church, that general for the world and that special to the various nations. He himself was president of the committee to which he assigned the following cardinals: Seraphin Vanutelli, Agliardi, Vincent Vanutelli, Satolli, Rampolla, Gotti, Ferrata, Cassetta, Mathieu, Gennari, Cavicchioni, Merry del Val, Steinhuber, Segna, Vives y Tuto and Cavagnis. Archbishop (later Cardinal) Gasparri was appointed secretary. The plans of the various titles have been confided to canonists in every country. The general plan of the Code includes (after the preliminary section) four main divisions: persons, things (with subdivisions for the sacraments, sacred places and objects, etc.), trials, crimes and penalties. The articles are numbered consecutively. The work is now completed and embodies several modifications and reforms in the ancient law. This code is now the only authorized canon law of the Latin Church.

It will have been noticed that canon law is not traceable to any original code, but is a development founded on the general moral rules laid down in the Scriptures and especially in the New Testament. Neither is the Roman civil law traceable to any code, but is a gathering of principles suggested by good reasoning for promoting the civil interests of its subjects. Compared to the Jewish law, the principle upon which Roman jurisprudence was founded was very different — the former treats principally of criminal matters and is most severe in its penalties; the latter on the contrary treats all questions as civil, and prefers restitution to punishment. When the Roman emperors had been converted to Christianity, in promoting its progress by special constitutions which then became part of the canon law, they necessarily gave to canon law much of the spirit of their civil law. Thus it happens that in the canon, as in the Roman civil law, there was little severity in criminal matters, and many cases which other peoples than the Romans treated as criminal were cognizable by a civil tribunal and an indemnification was effected by damages. Generally no crime was punished capitally, especially where no force or violence was employed. This spirit of leniency is manifest throughout canon law to the present day. During and after the 4th century wherever Roman power conquered the nations and wherever Christian missionaries converted the pagans canon law was introduced through the influence of the Pope and the Emperor. It permeated and modified the laws of the peoples of northern Europe, as well as those of England to a certain extent. With it necessarily came the principles of Roman civil law. The rules for the application of canon law were as follows: (1) In cases not contained in the civil law, or the rule for which was obscure, open to doubtful interpretation, or not expressly determined, if expressly and clearly resolved by the canon law, this latter formed the basis of the decision; and on the contrary, if the case was not provided for, or ambiguously resolved by canon law, when it was expressly met or its solution more clearly indicated by the civil law, this latter was to be preferred. (2) In cases of conflict, the civil law formed the rule for courts of civil, and the canon in those of ecclesiastical, jurisdiction. Thus, when a matter of canon law cognizance arose in the civil courts the decision was given according to the rules of the canon law; and vice-versa, when a question of civil cognizance occurred before an ecclesiastical tribunal. (3) Within the Imperial states the civil law formed the basis, and the canon law in the papal states. (4) In matters of a feudal nature the civil was preferred to the canon law. (5) In forensic causes the canon is not presumed to differ from the civil law. When the Western empire passed under the rule of a barbarian race the Roman and the canon law were not only preserved, but to a great extent they influenced the legislation of the conquerors. Alaric, Attila, Ricimir did not disturb the outward form of Roman government. In the collection of West Gothic laws, gathered in 672 A.D., there are evident traces of the part which the Roman clergy took in the compilation. The Burgundian laws also show literal excerpts from the Roman law. Roman law is found also in the Bavarian code composed in the 7th century, as well as in the capitularies of the Franks, which commence in the year 560 and are introduced by a literal transcript of a novel of Valentinian. It is noteworthy that the German tribes did not force their laws upon their subjects in those portions of their conquests where the Roman law was acknowledged. It was natural, too, that the Churches, as juristical persons, should follow the Roman law, not only on account of its connection with religion and the great degree of favor it manifested toward the Church, but also of the accuracy of its provisions in this respect. Like the law of the Teutonic tribes, that of England is an accumulation of individual laws. While Britain was conquered by Julius Cæsar in 54 B.C., still it was only at the end of the 1st century of the Christian era that Roman manners, arts, architecture, language and laws were introduced. The Roman law superseded the customary laws of the island and remained in force until the year 455, when Britain became derelict because of the removal of the seat of empire to Constantinople and the impossibility of the emperors defending it against the Picts and Scots. Christianity was introduced into Britain under the Roman dominion and was preached in Scotland and Ireland before the year 430. Roman literature, arts and law, however, received a sudden check by the Saxons, who, when they invaded Britain, imposed their law upon the conquered people. The Danes subsequently did the same. Still we are informed by the Venerable Bede that Ethelbert, king of Kent, in 613, with the assistance of his wise men, made certain decrees and gave judgments between his subjects in conformity with the principles of Roman and canon law, at least so far as regarded sacrilege, bishops, and the like. Indeed, it is not surprising that the Saxons and Danes, whose codes contained a great admixture of Roman law, should have carried the same principles with them into their new settlement in England. Traces of a Roman original may be seen in the laws of Ina, king of the West Saxons, Offa, king of the East Angles, and in the laws published by Canute which were translated into Latin. Thus it happened that, when Edward the Confessor compiled a code out of the materials then at hand, much of the Roman and canon law was inserted and thus became the basis of much of the common law of England and the United States. During the dominion of the Saxons and Danes, those Britons who had fled to Wales were governed by their own princes. Howel Dha, in 940, is said to have assembled his bishops and the more literate among the laity for the purpose of revising the law which was translated into Latin at his command. In the 85th article he approves the Roman rule of two witnesses being sufficient in cases where no specific number is stated, and for holding the testimony of one to be insufficient, except of a woman in cases of rape, of a lord between two tenants, an abbot between two monks, a father between two of his children, a priest in a matter attested in his presence, and a thief turning king's evidence in the place of execution. Most of the Roman laws of this age seem to have been taken from the Theodosian code. Although the foot of the Roman soldier never trod on the bosom of Ireland, nor did a Roman general have a chance to introduce the Roman law, still the principles of canon law were enforced throughout Ireland and Scotland by Saint Patrick in his canons. One of them, translated by the Anglican Bishop Usher, reads: «Wherever any cause that is very difficult and unknown to all the judges of the Scottish nation shall arise, it is rightly to be referred to the see of the archbishop of the Irish (that is, of Saint Patrick) and to the examination of the prelate thereof. But if there, by him and his wise men, a cause of this nature cannot easily be made up, we have decreed it shall be sent to the see apostolic, that is, to the chair of the Apostle Peter, which hath authority of the city of Rome.»

In 680, at the command of Ethelred, Egfrid, king of Northumberland, Aldwulf, king of the East Angles, and Lother, king of Kent, Theodore, at that time archbishop of Canterbury, summoned a synod at Hatfield, in which the canons of the five general councils of Nicæa, Constantinople, Ephesus, Chalcedon, the second of Constantinople, were enforced, together with the concilia drawn up under Pope Martin at Rome in 648. He also collected in his capitularies the most important points of Church discipline. Later he wrote his 'Book of Penances.' In the latter half of the 8th century, Egbert of York made an extensive collection of canon law from the sources then existing. He also wrote the book 'De Remediis Peccatorum.' In the 8th century a collection was made in Ireland in which the Dionysian collection and Roman, Gallic and Irish councils are used. King Henry I, in 1100, endeavored to repudiate a number of Church laws and ordered that Peter's Pence was to be paid to the King instead of the Pope. Henry II entered into a controversy over the enforcement of canon law with Thomas à Becket. In 1215, by the Magna Charta, King John confirmed to the prelates and barons of his kingdom the freedom of election of the clergy, and this acted as a general acknowledgment of ecclesiastical rights and liberties. In 1230, Otho, the legate of Pope Gregory IX, held a national synod, and in 1268 Othobon, the legate of Pope Clement IV, held a second, both of which, as Blackstone says, had a great effect on the ecclesiastical jurisprudence of England. Under King Henry III, Boniface, archbishop of Canterbury, enacted several canons which seemed against the existing laws of the realm, and under Stephen an ecclesiastical and a secular party were formed, the latter adhering to the common law as tenaciously as the clergy and nobility did to the canon and civil law. In the Parliament of Merton, however, the adherents of the canon and civil law were defeated on the proposition to make *legitimatio per subsequens matrimonium* legal also in England as it was under canon and civil law. Under Richard II, more than 100 years later, the feud still existed. Anglo-canon law was further augmented by the decrees of provincial councils held under the archbishops of Canterbury, from Stephen Langton to Henry Chichiley, which were glossed by William Lindwood, and later enforced also by the archbishops of York. The king meantime had also enacted many statutes on the relations between secular and ecclesiastical jurisdiction. A statute of Henry VIII rendered void all canons which were contrary to the law of the realm or hurtful to the royal prerogatives, and provided a commission to revise them. Edward VI renewed the commission, but the code was not confirmed before his death. Mary repealed all these acts, but Elizabeth revived the first act of Henry VIII. In 1603 some canons were made in the convocation of the province of Canterbury and confirmed by the king but not by Parliament. It is held that, therefore, these bind the clergy in Church matters, but not the laity, except in so far as not repugnant to the laws of the realm. By acts of Parliament (26 Henry VII, 1; 35 Henry VIII, 3; 1 Elizabeth 1) the king was declared the supreme head of the Church, and it became treason (1 Ed. VI, 12; 5 Eliz., 1) to doubt it or to defend the supremacy of the Pope as head of the Church. These acts and subsequent ones reversed canon law in England, Ireland and Scotland. Speaking of the courts of the archbishops and bishops of the English Church to-day, Blackstone says: «An appeal lies from all these courts to the sovereign in the last resort, which proves that the jurisdiction exercised in them is derived from the crown of England. . . . It appears beyond a doubt that the civil and canon laws, though admitted in some cases by custom in some courts, are only subordinate and *leges sub graviori lege*. They are by no means with us a distinct, independent species of law, but are inferior branches of the customary or unwritten laws of England.» In Scotland many of the provisions of canon law became the law of the land. During the 16th and 17th centuries canon law was taught in the Scottish universities, and from very early times many of the youths of Scotland attended the schools of the Continent, whence not a few returned as doctors *in utroque jure*, that is, canon and civil law. The canons of provincial councils, held yearly, and at whose meetings representatives of the king were present, constituted a national canon law which was recognized by the Pope and by Parliament and enforced in the courts of law. Even to this day, though the ecclesiastical system of the country is Presbyterian, the old canon law still prevails to a certain extent. "So deep hath this canon law been rooted," says Lord Stair in his 'Institutes of the Law of Scotland,' "that even where the Pope's authority is rejected yet consideration must be had to these laws, not only as those by which the Church benefices have been erected and ordered, but as likewise containing many equitable and profitable laws which, because of their weighty matter and their once being received may more fitly be retained than rejected." In two old acts of the Scotch Parliament, made in 1540 and 1551, the canon and Roman law are mentioned as the common law of the country, the clause used being "the common law, baith canon, civil and statutes of the realme." Since the restoration of the Catholic hierarchy in England in 1850, and in Scotland in 1878, the churches under Roman jurisdiction have held various councils and enacted laws to fit the changed conditions. These laws, having been examined by the committee of cardinals in Rome appointed for such purpose, have become, as it were, a national canon law for the Catholics of those countries. In a similar way the Catholics of newly established nations, owing to various reasons, are ruled by a modified canon law which gives the bishops and superiors a very extensive authority. Such is the case at present in Canada, Australia and the United States. These modifications pertain chiefly to the election of bishops, the appointment and removal of parish clergy, the tenure and administration of Church property. The second and third plenary councils of Baltimore contain special modifications for the United States. For Mexico, West Indies and South America a council was held in Rome of the bishops of those countries, and its decrees were published in 1901. Other national modifications of canon law in the course of time have been introduced by concordats made by the Pope with the rulers of Christian nations by which he grants them certain concessions. As a nation Spain enjoys the greatest concessions. The councils held in Gaul in the 4th and following centuries show the beginning of a national canon law for France. The fourth canon of the Council of Arles, convoked by King Clovis in 511, prohibited certain laymen and teachers from receiving holy orders without the king's consent. The Council of Orleans, in 549, shows that at that time the king's consent was necessary for the election of bishops. Many points regarding a special liturgy, the administration of the sacraments, the matter and forms of ecclesiastical trials are to be found in these same early councils. The laws of Dagobert, in 620, show special protection given the Church but also lay the foundation for future subjection; for councils could not be held without consent of the king, and bishops were elected not infrequently at the dictation of royalty. But the capitularies of Charlemagne and his successors, collected in 825 by the abbot Ansegiso, were very favorable to the Church. Under the third dynasty, especially because of the feudal law, bishops, abbots and chapters exercised almost complete civil authority over the people in their charge; but the oath of fealty was imposed on the prelates as vassals of the king. On the other hand, the kings took upon themselves the defense and guardianship of the Church, and on the pretext that at the death of the prelate they were the guardians of the vacant see, they performed many acts of ecclesiastical jurisdiction, among which was the administration of the temporalities of the vacant church. This was not done, however, without the assent of the sovereign pontiffs. Herein is found the origin of *jus Regalia* which later caused such trouble. In the year 1268 a pragmatic sanction was issued by Saint Louis which gave liberty of election of bishops and ordered that the general canon law should be observed throughout France. However, the genuineness of this law has been seriously questioned. Under Philip the Fair the seeds of absolute independence of the secular from the spiritual authority were sown; and about the same time serious contests arose between clerical and lay judges concerning their jurisdiction. On appeal to the king the clergy won; but the jurisdiction of the Church was gradually lessened, and at this time the appeal "as from abuse" was introduced, that is, a clergyman might appeal to the king from an abuse of the power exercised by a bishop. This was diametrically opposed to general canon law. The great schism of the West brought out the question whether the Pope or an ecumenical council were superior, and the controversy became especially bitter in France. Charles VII selected certain passages from the Conciliabule of Basel, and in 1438 issued a pragmatic sanction in which the superiority of the council over the Pope was declared, and elections both to episcopal sees and in monasteries were to be held after the ancient law of France. Louis XI suppressed this decree, but it was revived after his death until finally condemned by the Fifth Lateran Council, and changed by the concordat made between Leo X and Francis I. In this concordat many of the dispositions of the pragmatic were preserved; but the concordat differed from the pragmatic in this: that in place of the election of bishops and prelates in case of vacancy the king was given the right to present to the sovereign pontiff, within six months, a doctor or licentiate in theology who should be at least 27 years of age and otherwise competent. The pontiff would grant institution. The Parliament, after a long contest, agreed to the execution of this concordat. Herein is seen the beginning of the system of government nomination of bishops, concerning which, in 1903–04, the Pope and the French government were at variance. In the 16th century the government long opposed the publication of the decrees of the council of Trent, but finally, without mentioning the source, the chief decrees, word for word, were published in 1579 by royal order. In 1681 the Gallican clergy, at the instance of the government, met in extraordinary convention and adopted a declaration favoring the extension of the *Regalia* to all France. This was repudiated by Pope Innocent XI. The next year the Gallican clergy adopted four propositions in which they attacked the Holy See in administering temporal matters, and declared that the judgment of the Pope on a matter of faith was not irreformable except when the consent of the Church had been added.

The king ordered the observance of this declaration, but it was condemned by Alexander VIII. Later, King Louis XIV wrote the Pope that he had ordered that the decree should not be observed. Nevertheless, the *Regalia* was observed up to 1789 throughout all France, and the government continued taking the revenues of all vacant bishoprics and appointing to benefices during the interregnum. In an edict of 1695 a code of ecclesiastical law as observed in France was enacted, and in it was the appeal "as from an abuse," that is, from the ecclesiastical to the civil authorities. The national convention in 1790 passed a civil constitution for the clergy by which dioceses and parishes were suppressed and the Church made subject to the state. In 1801 Napoleon, as First Consul, and Pope Pius VII made a concordat in which the Catholic Church was acknowledged as the state Church, and by which new limits were assigned to dioceses and parishes, and by which especially the right of nominating bishops was given to the ruler of France. To the nominees the Pope would grant institution. Various other regulations were made, and the French government took upon itself the support of the bishops and parish priests in place of restoring the immense Church properties which had been confiscated. During the year 1904 a great agitation occurred for the suppression of this concordat because of controversies over some bishops held delinquent and suspended by the Pope. The concordat was suppressed in 1906. With the abrogation of the concordat the state no longer supports the clergy, nor can it nominate to bishoprics. There is complete separation of Church and State in France since the passage of the law abrogating the concordat of 1801. During the 19th century the liturgical worship of the Church in France was made conformable to that of Rome, and other matters of discipline were brought under general canon law.

Undoubtedly canon law has exerted a wide and lasting influence on the nations of Europe and America. It made them Christian states and directly or indirectly modified their constitutions. State legislative assemblies based their proceedings on the methods of Church councils. The law of nations is simply the application to nations of the principles of Christian law taught to individuals. The ancient Romans as well as barbarous tribes considered all foreigners enemies; the Church taught the brotherhood of all men. The Pope, as the common father of all Christians, acted as arbitrator in the disputes between nations, and so noteworthy became the Roman Rota, to which the Pope referred international disputes, that at times much of its work was deciding important questions for rulers of nations. The system of Church administration served as a model for that of states, and the clergy, especially in the earlier and Middle Ages, being the educated class and following canon law, naturally introduced many of its rules into everyday life. The elevated condition of woman is due to the canon law prescriptions regarding marriage, which the Church enforced on all nations converted to Christianity. Questions relating to widows and orphans were within the jurisdiction of canon law and Church courts. The incorporation of Church bodies, from which other corporations took their origin, had its foundation in the law of Justinian and was imported into England with the civil and canon law. As in the Roman law, the charter of the sovereign is always expressed, or at least implied. From England the idea of corporation and corporation sole came into American law. The writ of habeas corpus had its origin in the Roman law "*interdictum de libero homine exhibendo.*" Inheritance by will and the rule for the descent of real property came from Roman law, while trial by jury, with challenges of the jurymen, was determined in the Roman Lex Servilia and Lex Cornelia. While in England "Christianity is part of the law of the land," in the United States this "is true only in a qualified sense" (33 Barb. 548), and owing only to "the fact that it is a Christian country and that its constitution and laws are made by a Christian people" (23 Ohio St. 211). Nevertheless "the decision of ecclesiastical courts or officers having, by the rules or laws of the bodies to which they belong, jurisdiction of such questions, or the right to decide them, will be held conclusive in all courts of civil administration, and no question involved in such decisions will be revised or reviewed in the civil courts, except those pertaining to the jurisdiction of such courts or officers to determine such questions according to the laws or usage of the bodies which they represent." (Quoted with approval in 98 Penn. 213). "Civil courts will not review the action of ecclesiastical tribunals except where rights of property are involved" (62 Iowa 567; 23 Ill. 456). Justice Strong, in 'Relations of Civil Law to Church Policy,' concludes: "I think it may be safely asserted, as a general proposition, that whenever questions of discipline, of faith, of church rule, of membership, or of office have been decided by the Church in its own modes of decision, civil law tribunals accept the decisions as final and apply them as made." See also LAW; CATHOLIC CHURCH, ROMAN.

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CANON OF THE MASS, that part of the mass following the sanctus. The rule of the Roman Catholic Church for celebrating the Eucharist is contained in this canon.

CANON OF SCRIPTURE. See BIBLE.

CANONESS. At the close of the 8th century the title of canoness was given to a class of women who took the vows of chastity and obedience, but not that of poverty, and were not cloistered, though they had a common table and dormitory, and were bound to the recitation of the breviary, as were nuns. They derived their name from their being enrolled in the canon or official list of the Church. Their occupations were chiefly education of girls, transcription and embellishment of Church office-books and embroidery of vestments. The advantages of such institutions as asylums in a rough age were soon visible, and they multiplied in consequence, but as in many houses the religious motive had little to do with entrance, a distinction was drawn ere long between canonesses regular and secular. The secular canonesses were for the most part members of princely or noble families, practised much state and luxury and retained none of the rule save the common dormitory and the recitation of the Hours in choir. In Germany, several abbesses of canonesses were princesses of the empire, kept up feudal state and furnished contingents to the Imperial army from their vassals; and at the Reformation some chapters adopted the new opinions, and subsist to the present day as Protestant foundations, enjoying the revenues, and admitting to membership only ladies of noble birth or daughters of distinguished members of the military and civil service, whose sole obligation is celibacy during membership. The institute never spread beyond the limits of the empire, and the non-German houses were chiefly in Hainault, Flanders and Lorraine.

CANONGATE, The, the principal street in the Old Town of Edinburgh. It is upward of one mile in length, rising gradually with a regular and steep incline from a small plain at the east end of the town, on which stands the palace of Holyrood, and terminating at the castle. The appearance of this street, the scene of many interesting historical incidents, is rendered remarkable by the loftiness and antique aspect of the houses with which it is lined, most of them ranging from five to seven stories in front, and often more behind. At different points it is known by other names, High street, Lawnmarket, etc.

CANONICAL BOOKS, the books of Scripture belonging to the canon. See BIBLE; CANON.

CANONICAL HOURS, certain times of the day set apart by ecclesiastical law in the Roman Catholic Church to the offices of prayer and devotion, namely, matins with lauds, prime, tierce, sext, nones, even-song or vespers and compline. These hours of prayer originated early in the Church's history, being mentioned by Clement of Alexandria, Tertullian, Jerome and others. The day was divided into seven parts and the observance of the canonical hours was as follows: prime, tierce, sext and nones at the first, third, sixth and ninth hours of the day, counting from six in the morning; vespers at the eleventh hour, compline at midnight and matins shortly after midnight. These times are no longer strictly adhered to. In England the canonical hours are from eight to twelve in the forenoon, before or after which the marriage service cannot be legally performed in any parish church. See BREVIARY and consult Bingham, 'Origines Ecclesiastici'; Proctor, 'On Common Prayer.'

CANONICALS, the prescribed dress or vestments worn by the clergy of the Roman Catholic, Protestant Episcopal and other churches when officiating at religious services. The wearing of vestments is of ancient origin. In all the pagan religions the priests wear symbolic garments, and in the Jewish system the priestly robes were very elaborate and significant. The modern Jewish system retains these ecclesiastical vestments and the ministers of many Protestant denominations wear such attire. See CHASUBLE; COSTUME, ECCLESIASTICAL; STOLE; VESTMENTS.

CANONICUS, Indian chief: b. about 1565; d. 4 June 1647. When the Pilgrims landed, he and his nephew Miantonomo (q.v.) were associate sachems of the fierce Narragansetts, mustering some 3,000 warriors. In the winter of 1621–22 he sent to the little colony, with about 50 fighting men, a bundle of arrows bound with a snakeskin, either as a preliminary of war or a demand of gifts to avert it. They returned the skin stuffed with powder and ball, and the frightened savages did not dare keep it. A lasting treaty was negotiated, and it was owing to the influence of Canonicus that the tribe never made war against the English, even many years after his death, till "King Philip's War" of 1675. In 1636, Roger Williams and his company sought refuge from the Massachusetts authorities among the Narragansetts. They were kindly received, and to them was granted the peninsula where Providence stands. In 1637 the Pequots of Connecticut were attempting to form a general Indian league to exterminate the English settlements, and the Massachusetts government sent an embassy to prevent the Narragansetts from joining it. Canonicus received them with great Indian pomp in his wigwam of poles and mats, surrounded by his "mugwumps" and leading warriors, gave them a feast with boiled chestnuts and huckleberry Indian pudding for dessert; and probably more from kind regard for Williams than through the embassy's persuasions, kept the peace, and even furnished a couple of hundred warriors to help the English. These allies, however, played the usual ambiguous Indian part, ready to massacre the beaten side. In 1644 the Gorton (q.v.) party succeeded in persuading the chiefs that it was under the protection of irresistible powers in England; and on 9 April Canonicus, his son Mixan and his nephew Pessacus, brother and successor of Miantonomo, signed two astonishing documents, of whose purport it is very unlikely that they had been correctly informed. One of them ceded the land and people of the Narragansetts to his Majesty of Great Britain, placing the Indians themselves under his protection, and appointing Gorton and three others their attorneys to carry the instrument to him. The other, addressed to the Massachusetts authorities, was the refusal of their invitation to visit Boston. It also menaced the authorities on account of Miantonomo's death and threatened to revenge it on Uncas. Finally, however, a truce was signed, and three years later Canonicus died.

CANONIZATION, a rite in the Roman Catholic Church by which a deceased person is inscribed in the catalogue of the saints and by which it is publicly, solemnly and canonically declared that such person is to be honored as a saint by all the faithful.

The desire to honor the dead is an instinct of human nature. The state picks out its great ones for civil honors; the Church holds up to the veneration of its members those who by the sanctity of their lives and their love of God and their fellow-men merit imitation.

The state honors its heroes on account of intellectual ability, oratorical gifts, courage or patriotism; the Church demands purity of life and eminent virtue in her spiritual heroes. As a proof of that virtue she requires miracles wrought by or through their intercession. The virtues, which must be heroic, and the miracles, are proved by a process most minute and searching.

During the early centuries the deeds of the martyrs were recorded by Christian notaries. For this purpose Pope Clement divided the city of Rome into seven quarters with a special notary for each quarter. The letters of Saints Cyprian, Jerome, Augustine and Epiphanius tell us of the efforts of the bishops to collect the deeds of the martyrs and to have them venerated.

In the early times individual bishops sifted the testimony regarding those brought to their notice as worthy of veneration and declared for or against it. But this gave rise to inconveniences and the necessity of a central authority for judging in such cases was made manifest.

As early as the 4th century the case of Saint Vigilius, bishop of Trent, who was martyred A.D. 399, was brought to Rome to secure the consent of the Pope for his veneration as a saint.

Gradually the procedure in these matters was elaborated and in 1587 the Congregation of Rites was charged with the duty of investigating the causes of Beatification and Canonization.

Beatification precedes Canonization, and is a decree which permits the honoring of a servant of God by public worship in a certain place. It differs therefore from Canonization in that the latter not only concedes but *declares* that veneration be paid by the universal Church to the canonized one whilst Beatification *permits* only in a certain place the honoring of the beatified.

The process by which Beatification is reached is a lengthy one. "The fierce light which beats upon a throne" is nothing to the minute and protracted inquiry which turns upon the everyday life of the person submitted to it.

Thirteen or fourteen steps may be distinguished in the process of Beatification. The bishop of the diocese first inquires at to the reputation of the person proposed for virtue and miraculous powers. Then the question of "*non-cultus*" is examined; namely whether any veneration was paid to the servant of God or whether any thing was done contrary to the decrees of Urban VIII which prescribes the form of Beatification and Canonization.

As a third step the minutes of these two inquiries are sent to Rome. The process is then opened before the Congregation of Rites. See CONGREGATIONS, ROMAN.

The Promoter Fidei (called in popular language the "devil's advocate") is appointed. His duty is to raise objections against the process and person. All the works printed or in manuscript, if the person were an author, are then examined. If a favorable report is made, then begins what is called the Apostolic Process. A commission is given to the Congregation of Rites to investigate the notoriety, reality and nature of the virtues and miracles ascribed to the one to be beatified.

Three bishops are appointed to deal with the case systematically. Their findings are sent to the Congregation of Rites and examined and arguments are heard pro and contra.

A new delegation makes another and more searching inquiry, if the result of the last examination is favorable. The process is again returned to the Congregation of Rites to be again examined. In three successive meetings, at the last of which the Pope is present, the virtues and miracles of the subject for beatification are again discussed.

Having sought to know the will of God by prayer the Pope confides his judgment to the secretary of the Congregation.

In a new general assembly the question is considered whether the Beatification may proceed without further delay. In the event of an affirmative decision the Pope appoints a day for the ceremony, and orders a brief to be prepared setting forth the Apostolic sentence.

The Beatification takes place in Saint Peter's with ceremonies appropriate to the occasion. Proof of at least two miracles is necessary in the case of Beatification, and before proceeding to Canonization it must be proved that at least two more miracles were wrought through the intercession of the "Blessed" person.

So strict is the examination of these miracles, that according to an Italian proverb, "It is next to a miracle to get a miracle proved in Rome." To prove the truth of miracles worked after Beatification, the same formality and rigorous conditions are required as are necessary in the case of miracles before Beatification.

The three congregations or assemblies which were required before Beatification are again convoked and after mature deliberation if everything is favorable to the Cause, declare for it. A decree is drawn up by the direction of the Pope expressing that decision. Canonization then takes place in Saint Peter's.

Most solemn ceremonies mark the event and never does the venerable Basilica with its thousands of worshippers look so grand and inspiring as when the Pope declares and ordains that the servant of God in question shall be inscribed in the register of the Saints ("Canon Sanctorum") and that his (or her) memory shall be celebrated on a given day in every church.

Consult the celebrated treatise of Pope Benedict XIV, 'De Servorum Dei Beatificatione et Beatorum Canonizatione' (1734–38), the standard work on the subject; a portion of it has been translated under the title 'Heroic Virtue' (3 vols., 1856); also Addis and Arnold, 'The Catholic Dictionary' (1893); Aichner, 'Compendium Juris Ecclesiastici' (1900); Baart, 'The Roman Court'; Bargilliat, 'Prælectiones Juris Canonici,' Vol. 1, pp. 344–45 (1903); Bouix, 'Tractatus de curia Romana,' 180 p. 183 (1880); Ferraris, 'Bibliotheca Canonica'; Fornari, 'Codex pro Postulatoribus'; Gardellini, 'Decreta authentica S. C. Congregationis Rituum'; Reiffenstül, 'Jus Canonicum Universum'; Schmalzgrüber, 'Jus Ecclesiasticum Universum'; 'Catholic Encyclopedia' (New York 1912). Consult also 'Catalogus ac Status Causarum Beatificationis' (Rome 1901).

CANONS, Book of, a system of canons or rules prepared for the Church of Scotland by its bishops, in accordance with the direction of Charles I. It was published in 1636, having undergone revision at the hands of Archbishop Laud. It limited greatly the power of the Church courts inasmuch as their findings were now subject to ratification by the bishops, and also asserted the king's supremacy in spiritual matters. Its promulgation was felt to be arbitrary, and the strongest objections were made against it.

CANONS OF THE CHURCH OF ENGLAND, the "constitutions and canons ecclesiastical" drawn up in convocation in 1604 by the synod in London. These canons, still in force as revised, number 141, and were designed to confirm the established system of the Church of England, particularly through the test oath, aimed at the Puritan party, in which the clergy were sworn to subscribe willingly to the supremacy of the sovereign, to the Articles and to the Prayer-book. Consult Walcott, 'The Constitutions and Canons Ecclesiastical of the Church of England' (Oxford and London 1874).

CANONS OF HIPPOLYTUS, The, a book divided into 38 canons, believed to have been written by Hippolytus, archbishop of Rome, about the middle of the 3d century. It contains instructions in regard to the selection and ordination of Christian ministers, conversion and baptism of the heathen, rules for the celebration of the Eucharist, for fasting, etc. The book originally was made from a Coptic version of the Greek but has been handed down only in Arabic. It first attracted attention in the 17th century, was published in 1870 by Haneberg, who added a Latin translation, and was revised by Achelis in 1891. A German translation was made by Reidel in 1900 from new manuscript, which showed that the book had been previously thrown into disorder by the displacement of two pages, and which also removed other difficulties upon which the theory of interpolation was based. There has been much controversy about the authorship of the book and as to whether the canons were the original form from which the Egyptian Church Order was derived, but all documents, as well as the general style of writing, point to Hippolytus as the author.

CANONSBURG, Pa., borough of Washington County, on the Pittsburgh, Cincinnati, Chicago and Saint Louis Railroad, 18 miles southwest of Pittsburgh. Named after Col. John Canon, who plotted the town in 1789. It was the active centre in 1794 of the Whisky Insurrection. In 1802 it received a borough charter. It is situated in a rich coal region and has manufactures of sheet iron, structural steel, tin plate, stove pipes, pottery, etc. The original building of Rev. Dr. John McMillan's Latin School, founded in 1780, the Pennsylvania Training School, the buildings of Jefferson College founded in 1802, now part of Washinton and Jefferson College (p.v.), are situated here. Pop. with South Canonsburg annexed 5,588.

CANOPIC VASES, or **CANOPI,** certain large-bellied vessels found in tombs of Egypt, containing the embalmed viscera of bodies that had been converted into mummies. Four of these were placed in a tomb, each appropriated to a particular deity, and surmounted by the effigy of the head of such deity, as of a man, an ape, a jackal or a hawk. It is to those with the human head that the term canopi has been more particularly applied. They were frequently made of basalt, and decorated with figures in relievo or paintings; or of costly white alabaster, with spiral flutings; or they were formed from black burned clay. The name is derived from the town Canopus.

CANOPPI, kä-nō'pē, **Antonio,** Italian scene-painter: b. 1773; d. Saint Petersburg 1832. He received his first education from his father, who was employed as civil engineer by the Duke of Modena, and after occupying himself for some time with fresco-painting, was subsequently employed as scene-painter in Venice and Mantua. Compelled to resort to flight at the time of the French invasion, he first betook himself to Vienna and afterward to Moscow, where he was engaged in the decoration of many places, which, however, were burnt in the great fire of 1812. From that time until his death he was engaged as scene-painter of the Imperial theatre of Saint Petersburg. His most admired efforts in that branch of art were his architectural scenes for Mozart's 'Magic Flute,' and for 'Semiramis.'

CANOPUS. (1) In Egyptian mythology, a water-god, represented on vessels of a spherical shape. These vessels were used by the ancient Egyptians to keep the water of the Nile in good drinking condition. The worship of Canopus was superseded under the first Ptolemy by that of Serapis— a Greek inscription in honor of Serapis at Canopus having been discovered by Mr. Hamilton amid the ruins of Alexandria. (2) In ancient geography, one of the most remarkable towns of lower Egypt, near the most western mouth of the Nile, about 14 miles east of Alexandria. The name of the town is variously ascribed to the divinity of the same name and to Canopus, or Canobus, the helmsman of Menelaus, who died in Egypt of the bite of a serpent, after his return from Troy, and who was buried on the site of the town. It became important after the foundation of Alexandria, as a summer resort of doubtful reputation. It was an important port, and although the channel is now filled up, there are still ruins of the old city on the shore at Aboukir. It was the seat of a temple at Serapis (successfully excavated in 1893), whose oracle was celebrated, especially among the sick seeking for restoration to health.

CANOPUS, or **CANOBUS,** the brightest star except Sirius of the first magnitude, belonging to the southern constellation Argo, and invisible in the north or middle parts of the United States, on account of its nearness to the South Pole. It is one of the few brilliant stars for which no sensible parallax has been found. The name, according to Plutarch, was derived from Canopus, the pilot of Menelaus.

CANOPY, in general, any suspended covering that serves as a protection or shelter, as an awning, the tester of a bed, or the like; especially, an ornamental covering of cloth suspended on posts over a throne or the seat of a high dignitary, or any covering of cloth so disposed. In architecture, it is the decorative hood or cover supported or suspended over an altar, throne, chair of state, pulpit and the like; also the ornamented projecting head of a niche or tabernacle. Early English canopies are generally simple with a trefoiled or cinquefoiled heads. The triangular arrangement over an early English and decorated doorway is often called a canopy.

CANOSA, kä-nōs'sä, **DI PUGLIA,** Italy, city in the province of Bari delle Puglie, 14 miles to the southwest of Barletta on the Adriatic.

The cathedral of San Sabino, with pavement several feet below the surface of the street, was built about 1101. In an adjacent court is the tomb of Bohemond I; it has bronze doors by Ruggieri of Amalfi. There is a ruined castle, built by Charles I of Naples. It was the ancient Canusium, and various relics of Roman times, including an ampitheatre, have been found. Between Barletta and Canosa was the ancient Cannæ (q.v.), where in 216 B.C. Hannibal defeated the Romans. Tombs cut in rock on a hill have been found in the neighborhood, and in 1813 a beautiful burial-chamber was opened, which contained the corpse of a warrior in armor. A copper lamp and a number of beautiful vases were also found here. The paintings upon the vases were the most important part of this discovery. They refer to the Greek-Italian mysteries. The town was founded by the Greeks, and till the Second Punic War was an important commercial centre. Pop. about 26,000.

CANOSSA, small village in northern Italy, 12 miles southwest of Reggio. On a rock near by are the ruins of Canossa castle, which was destroyed by the inhabitants of Reggio in 1255. In the 11th century the castle belonged to Countess Matilda of Tuscany, with whom Pope Gregory was staying in 1077 when the German Emperor Henry IV came to render submission after his excommunication by the Pope. The monarch was compelled to stand barefooted in the courtyard for three days and nights before the pontiff would receive him. Bismarck in 1871 used the historic phrase, «We are not going to Canossa,» in a speech directed against the clerical party. Hence, «going to Canossa» signifies submitting to humiliation.

CANOT, kä-nō', **Theodore,** Italian adventurer and slave trader: b. Florence 1807; d. 1850. His father was a French officer. He visited Boston, sailed to various parts of the world, was shipwrecked near Ostend, and again on the coast of Cuba, where he fell into the hands of a gang of pirates, one of whom claimed to be his uncle, befriended him for some time, and finally sent him to an Italian grocer at Regla, near Havana, who was secretly concerned in the African slave trade. Canot made his first voyage to Africa in 1826, landing at the slave station of Bangalang, on the Rio Pongo, Senegambia. After quelling a mutiny on board and helping to stow away 108 slaves under 15 years of age, the young adventurer entered the service of the owner of the station. He visited various parts of the neighboring country, collecting by aid of the African princes a stock of slaves for his newly-established depot at Kambia near Bangalang, which in May 1828 was destroyed by fire. He afterward purchased a vessel at Sierra Leone, in which with a cargo of slaves wrested from a trader in the Rio Numez, he sailed to Cuba. Three more expeditions soon followed; in the first he lost 300 slaves by smallpox; in the last he was taken by the French and condemned to 10 years' confinement in the prison of Brest, in France, but after a year's durance was pardoned by Louis Philippe. He returned to Africa, and was the pioneer of the slave traffic at New Sestros. After a pleasure trip to England he returned to New Sestros and in 1840 shipped to Cuba 749 slaves. He now resolved to abandon his illicit course, and obtaining from an African chief a valuable grant of land at Cape Mount, established there in 1841 a trading and farming settlement under the name of New Florence, which in March 1847 was destroyed by the British, who suspected it to be a slave station. Canot subsequently removed to South America, then to Baltimore, Md., and finally received from Napoleon III an office in one of the French colonies in Oceanica. Consult Mayer, 'Captain Canot, or Twenty Years of an African Slaver' (1854).

CANOVA, kä-nō'vä, **Antonio,** Italian sculptor: b. Possagno, Treviso, 1 Nov. 1757; d. Venice, 13 Oct. 1822. He was the founder of a new school of Italian sculpture in which softness and delicacy of expression predominate. Canova came of a family of stone-cutters and makers of small statuary. At a very early age he was taught by his grandfather to draw, design and copy the statuary in his workshop. He very early showed talent and great interest in the traditional trade of his family; and in this he was encouraged by his grandfather, who acted as his guardian, for his parents had died while he was still an infant. Before his tenth year Canova had begun to imitate the work of his elders; and two small shrines executed by him at this period are still in existence. From this time on he worked continuously in the shop of his grandfather, who had some knowledge of painting, drawing and architecture, a strong love for his profession and a desire to see his grandson distinguish himself in it. At the age of 13 the boy had already acquired a local reputation which attracted the attention of Giovanni Falieri, senator and member of an old patrician family, and a man of great influence in the community, who introduced him to Torretti, a local sculptor. Canova worked with and studied under the latter for two years and went with him to Venice, where Torretti died a few months later. The boy continued with Ferrari, a nephew of Torretti, who made marble house decorations. While here Canova made for his patron Falieri two statues 'Orpheus' and 'Eurydice,' in which the latter saw evidence of great talent, and gave him an order for more. The next three years were, for Canova, a period of study, attendance at the art and other classes in the school and of investigation in anatomy and working from natural objects; at the end of which time he presented to his patron work much superior to anything he had previously done, among them 'Dædalus and Icarus,' the best known of his works of this period. As his reputation grew he turned his eyes toward Rome, then the centre of Italian art, as it is to-day. Falieri came to his aid and secured for him a pension of 300 ducats ($290) a year for three years from the Venetian Senate to enable him to continue his studies. In 1779, at the age of 22, he went to Rome with a letter of introduction to the Venetian ambassador, who became his friend and patron. There Canova applied himself to study and work with enthusiasm; and under the influence of the city, its ancient monuments, its traditions and the enthusiasm inspired by Winkelmann and other students and reformers of art, the young Venetian developed rapidly and soon acquired, in the Imperial city, a reputation superior even to that he had left behind him in Venice. 'Theseus Sitting upon the Slain Minotaur' was the first large work by Canova in Rome (1783). In 1783 he undertook the execution of the tomb of Pope Clement XIV, in the church Degli Apostoli. He retained the usual style of composition, and only improved on the depraved taste of the school of Bernini. He next executed the group of 'Cupid and Psyche,' in which he first displayed his own peculiar style, of which loveliness is a striking characteristic. The figures are exceedingly delicate and graceful. He was employed on a second public monument, the tomb of Pope Clement XIII, in Saint Peter's, which was finished in 1792. It is distinguished for its colossal size and simple style. Meanwhile the fame of the artist continually increased. He established in the palace of the Venetian Ambassador a school for the benefit of young Venetians. His next works were a winged Cupid, standing; another group of 'Cupid and Psyche'; a group of 'Venus and Adonis' for the Marchese Verio, in Naples; the tomb of the Venetian Admiral Emo, for the republic of Venice. This latter is a combination of bas-reliefs with figures in full relief. In a very lovely 'Psyche,' standing, half-dressed, with a butterfly in her left hand, which she holds by the wings with her right, and contemplates with a calm, smiling mien and a 'Repentant Magdalene,' natural size, he has carried the expression of blending and softness to the highest degree. His 'Hebe' is a delightful figure. In an easy and animated attitude the smiling goddess of youth hovers over a cloud, pouring nectar with her right hand into a bowl which she holds in her left. Both vessels, as well as the coronet of Hebe and the edges of her garment, are gilt. Canova is fond of a variety of material, and often endeavors to give to his statues the effect of pictures. He displayed his talent for the tragical in the raging 'Hercules Hurling Lichas into the Sea.' The group is colossal, and Hercules is somewhat larger than the Farnesian; but it makes a disagreeable impression, for the genius of Canova was not adapted to such subjects. His representation of the two pugilists, 'Kreugas and Demoxenos,' is much more successful. A standing group of 'Cupid and Psyche' was the triumph of his art. Psyche here appears again holding the butterfly. In 1796 and 1797 Canova finished the model of the celebrated tomb of the Archduchess Christina of Austria, wife of Duke Albert of Saxe-Teschen, which in 1805 was placed in the church of the Augustines at Vienna. In 1803 he made the colossal statue of the King of Naples, one of his finest works, which is 15 palms high, and executed in marble. During the revolution of 1798 and 1799 Canova accompanied Prince Rezzonico on a journey through Germany. On his return he remained for some time in the Venetian territory, and painted for the church of his native village an altar-piece, in which are represented the dead Christ, the Marys, Nicodemus and Joseph, and, on high, God the Father. He afterward executed, in Rome, his 'Perseus with the Head of Medusa,' which, when the Apollo of Belvidere was carried to France, occupied its place and pedestal. This statue increased the fame of Canova more than any of his preceding works. But Perseus is only an imitation of the Apollo. The separate parts are of exquisite beauty in form as well as in masterly, delicate finishing. In 1802 he was invited by Bonaparte to Paris to make the model of his colossal statue. In the beginning of 1803 the model of the Emperor's bust, and afterward that of his statue, was to be seen in the workshop of the artist. There is not a more successful work of the kind than this bust: the figure of the statue is not so good. Among the later works of the artist are a Washington, of colossal size, in a sitting attitude; the tombs of the Cardinal of York and of Pius VII; an imitation of the Medicean Venus; a 'Venus Rising from the Bath'; the colossal group of 'Theseus killing the Minotaur,' far surpassing his earlier works in the heroic style; the tomb of Alfieri, for the Countess of Stolberg, in Florence, and erected in that place (the 'Weeping Italia,' a colossal statue in marble, is particularly admired); the 'Graces Rising from the Bath'; the monument of the Marchioness of Saint Croce; a 'Venus'; a 'Dancing Girl,' with almost transparent garments; a colossal 'Hector'; a 'Paris'; a 'Muse,' larger than natural size; a model of a colossal 'Ajax'; and the model of a sitting statue, in rich robes, of the Archduchess Maria Louisa of Austria. After the second fall of Napoleon, in 1815, Canova was commissioned by the Pope to demand the restoration of the works of art carried from Rome. He went from Paris to London, and returned to Rome in 1816, where Pius VII inscribed his name in the golden book of the capitol, declared him "to have deserved well of the city of Rome," and made him Marquis of Ischia, with a pension of 3,000 scudi.

As a man Canova was active, open, mild, obliging and kind toward everybody. His opinion of himself was very modest, notwithstanding his fame. He assisted promising young artists, and established prizes for the encouragement of the arts. When the Pope conferred upon him the title of Marquis of Ischia, with a pension, he dedicated the latter to the support and encouragement of poor and deserving artists. Canova was also an agreeable painter, but, strangely enough, more of a colorist than a correct designer. Engraved copies of all his works have appeared in Italy and at Paris. Consult Missirini, Melchior, 'Vita di Canova' (1824); Cicognara, 'History of Modern Sculpture' (Venice 1825); Quatremère de Quincey, 'Canova et ses ouvrages' (Paris 1834); Tripaldo, 'Biographia degli Italiani Illustri'; Anzelmi, 'Opere Scelte di Antonio Canova' (Naples 1842); Meyer, A. G., 'Canova' (1898); Borzelli, Angelo, 'La Relazione del Canova con Napoli' (1901); Malamani, 'Canova' (Milan 1911).

CANOVAI, kä-nō-vä'ē, **Stanislao**, Italian ecclesiastic and historian: b. Florence, 27 March 1740; d. Parma, 17 Nov. 1811. Having taken holy orders, he officiated afterward as professor of mathematics at Parma. In 1788, as a member of the academy of antiquities, he contended for the prize which was offered for an essay on Amerigo Vespucci. He opposed the common opinion that Columbus was the first discoverer of the New World, claiming that Vespucci one year before him had touched upon the northern part of the continent and had landed in Brazil. His paper gained the prize, but produced much discussion. He was also the author of several books on mathematics and history.

CANOVAS DEL CASTILLO, kä'nō-väs dĕl käs-tēl'yō, **Antonio,** Spanish statesman and man of letters: b. Malaga, 8 Feb. 1828; d. Santa Aqueda, 8 Aug. 1897. He was editor of the Conservative journal, *Patria,* and in 1854 entered the public service as member of the Cortes; thereafter he held various posts in the government. At his death he had been for two years Prime Minister, and had held the same position three times previously. He is author of 'Literary Studies' (1868); 'History of the Austrian Dominion in Spain' (1869); 'Problems of the Time' (2 vols., 1884); 'Studies on the Reign of Philip IV' (3 vols., 1888–90). He was editor-in-chief of a 'General History of Spain,' consisting of monographs by sundry writers (1890–97). He was assassinated at the baths of Santa Aqueda. Consult Pons y Humbert, 'Canovas del Castillo' (1901).

CANROBERT, käṅ-rō-bār, **François Certain,** marshal of France: b. Saint Céré in Lot, 27 June 1809; d. Paris, 28 Jan. 1895. He was educated in the military academy of Saint Cyr, and in 1828 entered the army. He had seen nearly 20 years' brilliant service in Algeria, and had actively supported the future emperor at the *coup d'état* of 1851, when he received the rank of a general of division in 1853. As such he commanded the first division of the French army under Marshal St. Arnaud, sent to the Crimea in 1854; and at the battle of the Alma was wounded in the breast and hand by the splinter of a shell. On St. Arnaud's death, nine days later, Canrobert assumed the chief command of the French army and was sent to Sweden and Denmark on diplomatic missions. According to the historian, Kinglake, he deliberately retarded the progress of operations, let slip many opportunities and hampered the English — his object being to forward Napoleon's design of coming out to head a final and victorious campaign. In the war in Italy against the Austrians (1859) Canrobert had the command of the third division of the French army, and at the battles of Magenta and Solferino his *corps d'armée* was engaged. In the Franco-German War of 1870 he was shut up in Metz with Bazaine, and became a prisoner in Germany. He was an ardent Imperialist till the death of the Prince Imperial (1879). In 1876 he became a member of the Senate and was returned in 1879 and 1885. Consult Martin, 'Le Maréchal Canrobert' (Paris 1895).

CANSO, Gut or **Strait of,** a narrow strait or channel, about 17 miles long and 2½ miles in width, separating Nova Scotia from Cape Breton Island, leading from the Atlantic Ocean into Northumberland Strait. It is navigable by the largest ships, and its scenery is very beautiful.

CANSTADT, kän'stät, the name given, from Cannstatt or Canstadt, Germany, to the dolicho-cephalic or long-headed man of the Quaternary Age, whose existence was inferred from a piece of skull found near there in 1700, by Duke Eberhard Ludwig. Consult Mortillet, 'Le préhistorique' (Paris 1900).

CANSTEIN, kän'stīn, **Karl Hildebrand von,** German philanthropist: b. Lindenberg 1667; d. 1719. He studied at Frankfort-on-the-Oder, traveled much in Europe, went in 1688 to Berlin, where he was appointed page of the Elector of Brandenburg, and served as a volunteer in the Netherlands. A dangerous sickness obliged him to leave the military service. He went to Halle, where he became familiarly acquainted with Spener and Francke, and became eager to spread a knowledge of religion among the common people. He was especially anxious that the poor should have Bibles at as low rate as possible, and thus originated the famous institution called the Canstein Bible Institution, which after the death of Canstein in 1719 became associated with the institutions founded by Francke, and still continues its benevolent operations. He wrote a 'Harmony of the Four Evangelists' and a 'Life of Spener.' Consult Francke, 'Memoria Cansteiniana' (Halle 1722) and Bertram, 'Geschichte der cansteinischen Bibelanstalt' (Halle 1863).

CANT-TIMBERS, in ship-building, those timbers which are situated at the ends of a ship. They derive their name from being *canted,* or raised obliquely from the keel, in contra-distinction from those the planes of which are perpendicular to it.

CANTABILE, kăn-tä'bi-lā, in music, a term applied to movements intended to be performed in a graceful, elegant and melodious style.

CANTABRI, the rudest and most savage of all the Iberian tribes who inhabited the greater part of what is now La Montana and the northwest part of the province Burgos. They defied Roman arms for a long time, and though the campaign against them began in about 150 B.C., they were not subdued until Augustus and Agrippa had carried out a series of campaigns against them. They were included in a part of the province of Hispania Tarraconensis, with some measure of self-government. But some time elapsed before they became romanized. In ancient history *Cantabri* is used to denote all of the inhabitants of the northern mountains of Spain.

CANTABRIA, the name applied to a district of Spain on the south coast of the Bay of Biscay, the home of the Cantabri (q.v.).

CANTABRIAN MOUNTAINS, the general name of the various mountain ranges extending for a distance of over 300 miles from the western Pyrenees along the north coast of Spain to Cape Finisterre. They attain in some parts a height of about 9,000 feet, and are rich in minerals, especially copper, lead, iron and gold. Large forests of oak, chestnuts and other trees are also found on their slopes. On the western coast they are very steep and form a bold seacoast, but on the southern and eastern slopes, they are less rugged and descend gradually to the Castilian plateau. Local names are given to different portions of the ridge.

CANTACUZENUS, kăn-tä-koo-zā'noos, **John,** Byzantine emperor and historian: b. about 1292; d. about 1380. While minister of Andronicus III he negotiated a favorable peace with the Genoese in 1336, and repelled the encroachments of the Turks in 1337. On the death of Andronicus in 1341 Cantacuzenus became regent during the minority of the young emperor, John Palæologus. He defeated the

CANTERBURY CATHEDRAL

Bulgarians and Turks, assumed the diadem and entered Constantinople, victorious over his rivals, in 1346. In 1347 he became joint emperor with John Palæologus, but really usurped the royal authority. He used his power with moderation, and endeavored to heal the wounds which five years of civil war had inflicted on the state; but religious disputes, civil dissensions and foreign enemies soon disturbed his government; and the jealousy of Palæologus, the rebellion of his own son, war, plague, the frightful disorders which prevailed in the empire, and his own loss of popular favor, induced him to renounce the crown. He retired to a monastery (1355), where he employed himself in literary labors. He is considered one of the greatest among the successors of Constantine. His 'Four Books of Byzantine History' were printed in 1645, and belong to the collection of the Byzantine historians. His other works, principally theological, are partly printed in the collections of Byzantine historians and partly in manuscript. Consult Pears, 'Destruction of the Greek Empire' (London 1903); Val-Paricot, 'Cantacuzème, homme d'état et historien' (1845).

CANTAGALLO, kăn-tä-găl'lō, Brazil, town, Rio de Janeiro state, 100 miles by rail northeast of Rio de Janeiro. The chief industry is coffee growing; sugar cane and fruits are also cultivated and cattle and swine raised. The former gold placer mines have been exhausted. Pop. 26,000.

CANTAL, kän' täl', France, a central department; area, 2,215 square miles; capital, Aurillac. It is named from its highest mountain, the Plomb du Cantal, Mons Celtorum of the ancients, which rises to the height of 6,094 feet. The department is one of the poorest and least productive districts of France. The climate is rather severe near the mountains, and agriculture is in a backward state. The principal crops are rye, buckwheat, potatoes and chestnuts and some hemp and flax. Of wheat and oats the product is insufficient for the consumption. In the declivities of the mountains there is excellent pasturage; cattle, sheep, horses and mules are raised in large numbers; and on the refuse of the dairies numerous pigs are fed. The fat cattle from this department are much esteemed, and are sent to all parts of the country. Large quantities of cheese are made, and sold principally in the south of France under the name of Auvergne cheeses. There are deposits of coal and marble. Hot mineral springs are abundant, those of Chaudes-Aigues being the most frequented. Cantal is divided into four arrondissements, containing 23 cantons and 267 communes. Pop. 223,361.

CANTALOUPE, a small round variety of muskmelon, globular, ribbed, of pale-green or yellow color and of delicate flavor; first grown in Europe at Cantalupo, in Italy. See MUSKMELON.

CANTANI, kän-tä'nē, **Arnaldo,** Italian physician: b. Hainsbach, Bohemia, 15 Feb. 1837; d. Naples, 30 April 1893. He was educated at Prague, and was physician in the general hospital there. In 1864 he became professor of pharmacology and toxicology at Pavia; in 1867 he was director of the clinical institute at Milan, and in 1868 of that at Naples. In 1889 he became a senator of Italy. He investigated chiefly malaria, typhus and tuberculosis; and was influential in introducing the methods of German medicine into Italy. He wrote 'Manuale di materia medica e terapeutica' (1865); 'Manuale di farmacologia clinica' (1885–90).

CANTARINI, kăn-tä-rē'nē, **Simone,** also known as IL PESARESE, Italian painter: b. Pesaro 1612; d. Verona 1648. He studied under Guido Reni at Bologna, where he afterward painted a large number of pictures, all much in the style, but without the grace and delicacy, of his master's work. His 37 etchings more closely resemble those of Guido. Throughout his life Cantarini's intolerable arrogance made him numerous enemies; and after a quarrel with his chief patron, the Duke of Mantua, he died in Verona. Among his best-known paintings are an 'Assumption'; 'A Holy Family'; and 'Joseph and Potiphar's Wife.'

CANTATA, kăn-tä'tạ, literally, «sung music» to distinguish it from «sonata» or «sounded music.» A musical term applied to an elaborate vocal composition, with different movements, arias, recitatives, with piano accompaniment. Orchestral accompaniments are also found, and in character the cantata may be anything from a short oratorio to a slight opera not intended for dramatic representation. In early times the cantata was sung by a single vocalist to the accompaniment of one instrument, in which form it was called cantata da camera to distinguish it from the church cantata which had a religious text.

CANTEEN, in the United States, a soldier's metallic water flask, containing two to three pints, and covered with a woven fabric. In England the canteen is combination pan, dish and plate, for use at mess by the army. (2) The departments of the British garrison store, usually divided into a dry canteen and wet canteen, the former being for general groceries and provisions, and the latter for liquid refreshment, excluding spirituous liquors.

Previous to 1901, beer and wine were sold at canteens in the United States army, though spirits were prohibited. In that year an anti-canteen law went into effect, as the result of temperance agitation. Strong efforts were made in 1910 and 1911 to repeal the anti-canteen law, but they were unsuccessful. The canteen was succeeded by the «post exchange» (q.v.). The name, «canteen,» is sometimes given at present (1918) to the stores and restaurants for soldiers established at the front by such institutions as the Y. M. C. A. (q.v.).

CANTERBURY, England, cathedral city, a parliamentary and a municipal borough, and a county borough under the Local Government Act of 1888. It is situated in the eastern division of the county of Kent, 55 miles distant by road from London and 62 by rail. It stands on the banks of the river Stour, is 14 miles from Margate and 16 from Dover. It is connected with Whitstable by means of a branch line of railway about seven miles in length. The town is on the lower London tertiaries.

Industries.— The district is chiefly agricultural. Canterbury was formerly noted for its silks, velvet and brocade manufacture. Breweries, linens and worsteds, leather, bricks and lime are the main industries. It is the centre of important corn and hop markets. Excepting the supply of electric light, there are no great municipal undertakings, not only the gas and waterworks but also the swimming baths being managed privately.

Churches, Buildings, Educational Institutions, etc.— There are 14 parish churches and various chapels. In addition to the churches, of which the most historic is Saint Martin's, built originally by the Romans, Canterbury contains a number of interesting buildings, the principal of which are "The Guildhall" (built 1439, rebuilt 1697), Market House, Saint Augustine's College, Chaucer's Inn, the 'Chequers of the Hope (1477), and the Crown Inn, erected by Prior Chilkenden in the 15th century. The only remaining city gate is the West Gate, rebuilt by Archbishop Sudbury, 1380, and now used as a Museum of Arms and Armory. Saint John's Hospital, East-bridge Hospital and Saint Nicholas Hospital at Harbledown are picturesque survivals of ancient charitable foundations.

The public library was established in 1858. The museum, which has been in existence since 1825, is, together with the public library, housed in the Beaney Institute. This institute was partially paid for out of a legacy of £10,000, left to the city by the late Dr. Beaney, a native of the city, who amassed a large fortune in Australia. The Cathedral library, which was founded in 1660, contains about 13,000 volumes, and the library at Saint Augustine's College has about 18,000 volumes. An art gallery was presented to the town in 1882 by Mr. T. Sidney Cooper, the famous artist, who was born in the city. Attached to the cathedral is a school founded by Henry VIII, and until recently a bluecoat school founded by Queen Elizabeth, now merged into a scheme called the Simon Langton schools. Saint Augustine's Monastery has been restored and enlarged and is now used as a Church Missionary College.

Canterbury Castle, one of the largest in England, was of Norman construction, but all that now remains of it is the keep.

The Cathedral.— The most remarkable object in the city is the cathedral, which is one of the finest ecclesiastical structures in England. No part of the original building remains. The cathedral is built on the site of a Roman church, which was renamed Christ Church by Saint Augustine when he was elected archbishop of Canterbury. The church was destroyed by fire the year after the Norman Conquest, 1067, but rebuilding was commenced three years afterward and was completed in 1130. This was again destroyed by fire four years afterward. It contains the tomb of Edward the Black Prince, 1376, also that of Henry IV and his Queen in the Trinity Chapel; the stone chair in which the archbishops are enthroned; and some beautiful 13th-century stained glass. The principal historical event connected with the cathedral is the murder of Thomas à Becket, which took place in 1170. The archbishop of Canterbury is Primate of all England and metropolitan for all the dioceses south of the Trent. See CATHEDRAL and CHURCH.

Government.— Canterbury sends a member to the House of Commons and is governed by a mayor, aldermen and councillors. Several charters have been granted to the city from time to time, the first by Henry II and the last by Charles II, who granted a charter of incorporation in 1686. The first mayor was elected in the year 1448.

History.— Canterbury is supposed to have been a place of importance before the Roman invasion, the Roman name *Durovernum* showing apparently the British prefix *Dwr*, water, although antiquaries differ in the interpretation of the remainder of the compound. Druidical remains have been found here, together with the British weapons termed celts. Its importance during the Roman occupation is proved by the discovery of a great variety of remains and it is interesting to note that bricks of Roman manufacture have been found in certain portions of the remaining walls. It derives its present name from the Saxon *Cant-wara-byrig*, the Kentishmen's city. During the residence of Ethelbert, king of Kent, the memorable arrival of Saint Augustine took place in 597 — an event rapidly followed by the conversion of this King and his people to Christianity and the foundation of the archiepiscopal see of Canterbury. In the 8th and the three following centuries, the city was from time to time dreadfully ravaged by the Danes, and on one occasion, in 1011, nearly the whole of the inhabitants, including women, children and the archbishop himself, were barbarously massacred, and the cathedral burned to its bared walls. It was gradually reconstructed and at the Conquest its buildings exceeded in extent those of London. The ecclesiastical importance of the place, in particular, advanced with great rapidity, and was consummated by the murder of Thomas à Becket, whose canonization by the Pope rendered Canterbury the resort of pilgrims from every part of Europe. Not only were the priory and see enriched by the offering of the wealthy devotees, but the prosperity of the town itself was greatly advanced by the money spent in it by so many strangers. Erasmus describes the church, and especially the chapel in which Becket was interred, as glittering with the gold and jewels offered up by the princes, nobles and wealthy pilgrims to his shrine. Henry VIII appropriated all its revenues on the dissolution of the priory in 1539, when he ordered the bones of Becket to be burned to ashes. Several of the English monarchs have made a temporary residence at Canterbury, which was also occupied by Oliver Cromwell in the civil war, whose troopers made a stable of the cathedral. Pop. (1911) 24,626.

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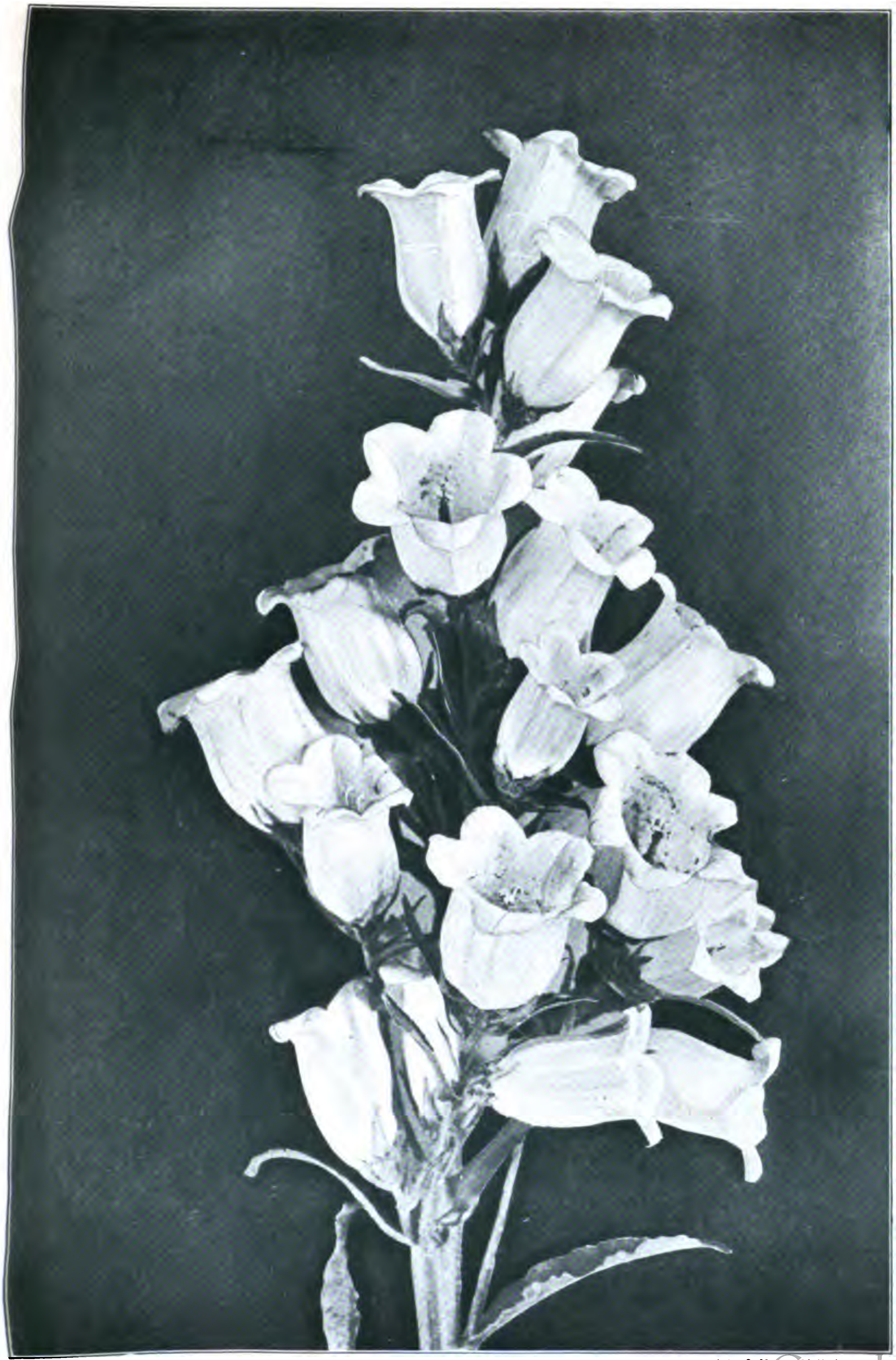
H. T. MEAD.
Librarian of the Public Library.

CANTERBURY, New Zealand, a provincial district occupying the centre of South Island; capital, Christchurch. Its area is 14,040 square miles. The interior is mountainous, and covered with dense forests. The famous Canterbury Plain, of 2,500,000 acres, slopes



Photograph by J. Horace McFarland Co.

CANTERBURY BELLS (CAMPANULA)

gradually down over a descent of 40 miles toward the sea. A rich loamy tract, admirably adapted for agriculture and cattle grazing, extends along the east coast, while the interior is a true pastoral country, well watered by numerous streams, and covered with a perpetual herbage of various grasses. A vast coalfield seems to underlie the whole country, and coal is worked in the districts of Timaru and Malvern. Good fire-clays, quartz, sand for glassmaking, marble, limestone, etc., are also found. The productions include wool, grain, frozen meat, skins and hides, butter, cheese and some silk. Pop. including Maoris, 173,185.

CANTERBURY-BELL, a name given to species of *Campanula* (q.v.), especially *C. medium.*

CANTERBURY TALES, The. ‘The Book of the Tales of Canterbury’ has a permanent claim on the attention of reading men. It represents the most mature and the most variously brilliant achievement of the man whom the world will always regard, and in many respects rightly, as the father of English poetry. In its structure it is, though uncompleted, the happiest scheme of the many that have been devised for presenting a series of stories in a manner at once natural, dramatic and the reverse of monotonous. In its setting it introduces us to an acquaintance on terms of intimacy with the society, high and low, of merry England's 14th century, an age of color, of contrasts and of essential liveliness. In its contents it offers an inviting approach, for most men probably the readiest, to the literature of the late Middle Ages, a realm of gold for all its dross, whose literary coin still bore, after its own peculiar fashion, some stamp of the antique Roman world and is still current in the world of beauty to-day.

‘The Canterbury Tales,’ as we know it, is a collection of 24 stories, two of them unfinished and two, for dramatic reasons, interrupted and not continued. These stories are bound together in a scheme, only partly realized, by means of the words of the host, Harry Bailey, toast-master of the occasion; by the talk of the pilgrims — the tellers of the tales — among themselves; and by occasional narrative and descriptive touches on the part of Chaucer, himself a pilgrim and reporter of the whole. Though some of the stories were composed earlier, the writing of many of them and the work of weaving them all into a garland seem to have been the chief literary activity of the last 15 years of the poet's life. For death found him with the work still unfinished.

The plan which the poet proposes at the beginning is characteristically ambitious; characteristically, again, it underwent modifications and adjustments as the work proceeded; this fact, together with the further rearrangements introduced by different copyists, makes it impossible always to speak with certainty of Chaucer's final intention. But enough of the structure emerges to give to the collection as a whole vastly more significance than any one story, or all of them arranged in a manner not so original, could possibly possess. It is perfectly possible for a continental critic, steeped in the literatures of the Romance tongues, to assert that he finds little in the ‘Tales’ that is new to him. He might be understood, if he preferred, as most English readers would not, Boccaccio's version of the story of Palamon and Arcite to that which Chaucer puts in the mouth of the Knight. He might assure us with some truth that the story of the patient Griselda is a translation and nothing more of Petrarch's Latin version of the ‘Decameron’ story. And so he might go through the list, conceding, however, perhaps more readily than the English reader, the originality of Chaucer's adaptation of the *fabliau* type in the ‘Miller's Tale,’ ‘The Reeve's Tale’ and the like, being more capable of appreciating these things in the Chaucerian spirit than the English reader, who is troubled, as Chaucer's audience plainly was not, by the indecorous character of the material upon which such splendid narrative artistry is lavished.

But to proceed thus is to refuse the poet credit for much that he has tried to do. He has not assembled his company of nine and twenty — perhaps there were a couple of priests besides — merely to treat us to a portrait gallery. High and low, every one, be it noted, succeeded in the life he had chosen, Knight, Squire, Monk, Prioress, on the one hand, Yeoman, Cook and Plowman on the other; rascals like the Friar, the Pardoner, the Summoner; professional men and tradesmen, and the never-forgotten Wife of Bath, all step before us, it is true, in the general prologue. Under the clear, encouraging eye of Chaucer they declare themselves for the folk they are, so that Dryden could see «their humors, their features and their very dress, as distinctly as if [he] had supp'd with them at the Tabard at Southwark.» If Chaucer had stopped here, if he had given us nothing beyond his prologue, he would still have written something more brilliant, more sympathetic than anything that can be found in mediæval literature before him, but nothing essentially different from, let us say, the ‘États du monde’ of many a French satirist. But Chaucer, fortunately, does not stop there. Having got his characters, he set out to order his material in terms of drama. Tale was to be adjusted nicely to teller; character was to play upon character; little personal hostilities, class prejudices, different individual reactions upon some general theme of discussion were to bring the successive stories naturally and dramatically into being, as the pilgrims took their leisurely way along the well-known road to the shrine of the martyred saint. There was to be a constant flow of narrative, washing pleasantly upon the alternate shores of fiction, grave or gay, and of the real life of his own time. This plan, as has been said, is imperfectly carried through. To have conceived it at all, however, and even in part to have given to it poetic expression is to have made a distinct and permanent contribution to the literature of the world.

The reader to-day, making his way through this «God's plenty» of stories, serious and trivial, dignified and the reverse, will find his pleasure in tracing out some of the threads of Chaucer's interests, which make up a strand capable of giving, in spite of imperfections, unity and significance to the whole. He will start easily with the ‘Knight's Tale,’ noting its nice adaptation to its grave, gentle, its thoroughly chivalrous teller, and he may, if he like, pass from this sort of serious, quasi-historical romance to romance of Oriental character in the multiplied wonders of the ‘Squire's Tale,’ to Arthurian matter in the ‘Wife of Bath's Tale,’ and to Chaucer's gentle and searching ridicule of degenerate romance in his own ‘Tale of Sir Thopas.’ But if he is wiser he will read the tales in their setting, interrupting with the drunken Miller the Host's well-laid plans and sharing with the Reeve his resulting indignation, noting in the stories of both the robustness of the characters and the richness of the social background. A like situation he will observe in the tales of the Friar and Summoner. With the ‘Physician's Tale’— and the experience will doubtless be repeated in the case of the tales of the Man of Law, the Shipman and the Manciple — he will miss the sense of delicate and inevitable adjustment; temporary assignments, stop-gaps, perhaps some of them were. But the ‘Pardoner's Tale’ is one of the most effectively told of all, and his prologue an amazing and subtle piece of psychologizing. With it he will be interested to compare that other essay in the “literature of exposure,” the tale of the Canon's Yeoman. ‘The Monk's Tale’ and the ‘Parson's Tale’ do not spring of sheer necessity from the situation, but they are excellent in character, and because informing and edifying, more delightful to contemporary readers than can nowadays be easily appreciated. And to the ‘Monk's Tale’ the humor of the Nun's Priest, set off with all the arts of a skillful preacher on a holiday, affords a perfect foil, just as Chaucer's ponderous ‘Melibœus’ contrasts with the gaiety, imperfectly grasped by the host, of his own ‘Sir Thopas.’ No more delicate adjustment is to be found between tale and teller than in the ‘Prioress's Tale,’ a story current all over Europe, but here enhanced in value by the artistic uses to which it is put.

Very much on Chaucer's mind, apparently, was the problem of what to do with a certain coarse, forth-putting type of woman whose determination to carry things in her own high-handed way was sure to make trouble for whatever member of the inferior sex she chanced to mate with. Harry Bailey has such a wife, and he has already confided some of his woes on this score to the pilgrims, when the president of this sect of “arch-wives,” the very embodiment of all their awful power, steps forward in the person of the Wife of Bath, and in good scholastic style, with full illustration from her own experiences, states her case. Such a subject will not down, and it is the clerk who makes the story of Griselda serve the end of a savage, though delicately administered, satire upon the extravagant positions advanced by the Wife of Bath. At once the Merchant cuts in with a hint of his own miseries in marriage and a story which makes clear his own theory of the bitter disillusion in store for those who trust their wives. It is possible that the ‘Squire's Tale,’ which treats of love, something quite apart from marriage, according to the mediæval view, might when finished have been brought into closer relation with what goes before. It is certain that it prompts the Franklin to tell his story presenting a husband, a wife, a clerk and a squire in such an amiable light, developing at the same time a theory of mutual forbearance and trust in marriage which is the finest flower of “gentilesse.” One can, if one wishes, push on further and tag the ‘Second Nun's Tale’ as presenting the ecclesiastical view of marriage as something inferior to celibacy.

But it would probably be wrong to do so or to insist that Chaucer, throughout the tales discussed, felt himself constrained to a rigid, doctrinaire discussion of marriage as a problem. He is concerned with the expression of human character in conduct, with the relations of man to his fellow men and women, and to God. Being of the Middle Ages he exhibits some of the conventions of the Middle Ages; the talk of his pilgrims unashamedly informs, it frankly edifies, it indulges in class satire and sex satire, it inevitably finds itself revolving around traditional questions — how do rogues thrive in the world? how shall we make terms with fortune? how is man to succeed in civilizing woman? what is the nature of true gentility? It is impossible for Chaucer to look thoughtfully on human conduct without proceeding in this way to raise these questions. Human conduct, again, for him, as for his time, falls naturally into the elastic and all-embracing category of the seven deadly sins. But this does not mean that Chaucer is writing a tract on marriage or a book of exemplary anecdotes to illustrate the seven deadly sins. It is unlike him to attempt anything so rigidly schematic; certainly whatever his intention he achieved nothing of the sort; it was not for nothing that Dryden called him “a perpetual fountain of good sense.” It is this good sense of his which has led him to pierce through the conventions in which he inevitably worked to the plane of our common humanity on which all who love good literature can affectionately meet with him.

Consult Skeat, ‘Complete Works of Geoffrey Chaucer’ (7 vols., Oxford 1894), and ‘Student's Chaucer’ (complete text in one volume, Oxford 1894); Hammond, Eleanor P., ‘Chaucer: A Bibliographical Manual’ (New York 1908); Kittredge, G. L., ‘Chaucer and His Poetry’ (Cambridge 1915); Legouis, E., ‘Chaucer’ (trans. by Lailevoix, London 1913); Tatlock and Mackaye, ‘The Modern Reader's Chaucer’ (New York 1914); Wells, John E., ‘A Manual of Writings in Middle English’ (New Haven 1916).

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CANTHARELLUS. See FUNGI, EDIBLE.

CANTHARIDES, or SPANISH FLIES, the blister-beetle (q.v.), when prepared for medical use. Their value is due to the presence of a chemical principle, called cantharidin, which constitutes from ½ to 1 per cent of cantharides, with the formula $C_{10}H_{12}O_4$. On hydrolysis, this is converted into cantharidic acid, $C_{10}H_{14}O_5$. Cantharadin is obtained by treating the pulverized insects with a solvent, such as alcohol, ether or chloroform (not water), the last being preferable. The solution is evaporated, and the residue is purified from a green oil which adheres to it obstinately, by digesting with bisulphide of carbon or by redissolving in alcohol. Purification is further affected by animal charcoal and the cantharidin crystallized from hot alcohol or chloroform.

Cantharides is used externally for its

counter-irritant action. It must be used with discretion especially in cases of older persons, children or paralysis. It must not be used in renal disease, owing to the risks attendant on absorption. It is administered internally in cases of impotence. Its criminal employment is usually intended to heighten sexual desire, and has frequently led to death. It produces severe gastro-intestinal irritation, and has toxic qualities, the patient usually dying from arrest of the renal functions. The antidote is the administering of bland fluids, such as milk, soda-water and plain water, to dilute the poison in the blood.

A number of insects other than cantharides possess the vesicant property, such as the Chinese beetle (Mylabris cichorii) which is especially rich in cantharidin, yielding about twice as much as the cantharides. Our native blister-beetles, when powdered, nearly resemble Mylabris in color, and are used as adulterants to cantharides.

CANTHOPLASTY (Gr. *kanthos,* «the angle of the eye» and *plastikos,* «formative»), the operation of slitting up the outer canthus or corner of the eye, so as to enlarge the opening between the lids, an operation proposed by Ammon when the eyelids are not sufficiently cleft, or when the eyelids produce tension on the eyeball, as in inflammatory processes.

CANTICLE OF THE SUN, The (Il Cantico del Sole), known also as the *Praises of the Creatures,* is the only work in Italian that we possess of Saint Francis of Assisi. Giulio Bertoni calls it «the most brilliant gem of the Italian religious poetry of the 13th century.» Renan goes even so far as to term it «the finest piece of religious poetry since the Gospels.» Written in the Umbrian dialect of the Saint's native region, its assonanced prose and occasional rhymes constitute in its primitive form one of the oldest monuments of mediæval Italian. It was improvised at San Damiano in the fall of 1225 at a moment of great spiritual exaltation during a reaction from a period of severe illness and mental stress. Tradition claims the last two stanzas as subsequent additions, the final one having been composed by Saint Francis just prior to his death, 3 Oct. 1226. Consult ‹Mirror of Perfection› Chap. CI, CXIX, CXX, CXXIII.

In this canticle Saint Francis lays bare his own simple, naïve soul, his wonderful love of inanimate nature, his artless faith and innate mystic love. He raises to the Creator a pæan of praise for the light of the sun, the moon and stars, the air and clouds, rain and fire, for mother earth, for those who forgive and endure in peace, and finally for the bodily death «from which no living man can flee.» In the loftiness of its inspiration the ‹Canticle of the Sun› must be compared to Psalm 148 of David. Like the famous ‹Fioretti› of Saint Francis, a work of later date, the ‹Canticle of the Sun› has touched the souls of men and has preserved in Italian hearts the popular tradition of their great Saint. It became in his last days the favorite song of Saint Francis, and must be regarded as the message of the Saint himself in all his joyousness, his hopefulness, his broad sympathy toward all things, his feeling for universal brotherhood. We must not look for great literary merit in this canticle. Francis was not a man of learning, nor in those primitive times was the art of verse in the vernacular sufficiently developed to be compared with the perfected compositions of the following century. Yet in his religious poetry Saint Francis is of the lineage of Jacopone da Todi, his Franciscan successor, who in turn is the precursor of Dante (consult ‹Paradiso,› canto XI). For a critical study of the writings of Saint Francis consult Robinson, Paschal, ‹The Writings of Saint Francis of Assisi› (Philadelphia 1906). For the Italian original text consult Sabatier, Paul, ‹Speculum perfectionis› (Paris 1898). For an English translation consult Cuthbert, ‹Life of Saint Francis of Assisi› (1914).

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CANTICLES. One of the canonical books of the Old Testament. The name is derived from the Latin *canticula,* plural of *canticulum,* «a little song.» In the Vulgate it is called *canticum canticorum,* «song of songs.» This is a literal translation of the Hebrew title which is generally understood to mean «the best song.» It may, however, signify «the best songs,» if the first word is taken in a collective sense, as it probably should be in the superscription «Songs of the Ascents» in the Pilgrim Psalter (Pss. cxx-cxxxii). The Alexandrian MS of the Greek version has the plural; the Old Latin apparently rendered the title *canticula canticulorum;* and the Targum paraphrases it «songs and hymns which Solomon uttered.» This is likely to be the original meaning. When the name of Solomon was added, it may have been the intention to characterize the collection as the choicest of the 1,005 songs ascribed to this monarch in 1 Kings v, 12. The conception of the work as a unit naturally led to understanding the title in the former sense. At the time when the canon was reduced as a result of the critical inquiry caused by the idea that holy books possessed a sanctity rendering it improper to touch profane things without a ceremonial washing after they had been handled, the question of canonicity arose; but it was settled at the Council of Jamnia (c. 90 A.D.) in favor of the book, probably through the weight of the traditional authorship and the allegorical interpretation R. Akiba seems to have adopted. Whenever in earlier times the allegorical exegesis was rejected, there was a tendency to question again the canonicity. To-day the literal sense is generally accepted, and most modern interpreters either look upon the love expressed in the poems as typical of spiritual devotion or seek for no ulterior significance, feeling with the historian Niebuhr that «something would be missing in the Bible, if there were not in it some expression of the profoundest and strongest of human emotions.»

There is no intimation of anything but the obvious meaning in the oldest Greek version, and the book is not mentioned by Philo or in the New Testament. But R. Akiba affirmed that the whole world was not worth the day when it was given to Israel, since all Scriptures were holy but this the holiest of all (‹Yadaim› iii, 5), and declared that «whoever sings from the Song of Songs in the wine-houses and makes it a (profane) song shall have no share in the world to come» (‹Tosephta Sanhedrin› xii). He no doubt saw in the book a description of the love of God and Israel, and this continued to be the interpretation in the synagogue. Hippolytus (c. 200 A.D.) applied it to the relation of Christ and the Church. In spite of his suggestion that the literary form is that of an epithalamium, Origen rejected the literal sense as inadmissible, and explained that according to the moral or tropological sense the love of the soul for the heavenly bridegroom was represented, and according to the mystic sense the union of Christ and the Church. The mediæval church also saw the love of Christ and the Virgin Mary depicted in the book. Bernard of Clairvaux wrote 86 sermons on it. A fine type of mystical interpretation is found in Teresa de Çepeda's commentary on the first chapter. Nicolaus de Lyra saw in the poem a prophetic adumbration of the course of ecclesiastical history, and Cocceius discovered in it the history of the Church down to the synod of Dort in 1618 A.D., just as the author of the Aramaic Targum had found in it the history of Israel down to 586 B.C. In the same way ingenious exegetes have discerned veiled descriptions of the political courting of the 10 tribes by Hezekiah, or of Samaria by Tirhaka. A different method was suggested by Honorius of Autun (died 1140), who held that the literal sense might be accepted, if a typical significance were attached to it, and this view has been adopted by Vatablé, Bossuet, Lowth and many Catholic and Protestant scholars in recent times. The type may then be thought of either as having already been in the mind of the author or only subsequently recognized. From the former standpoint a comparison has been made, e.g., by Harper with the poems of Hafiz, Jami and Jeyadeva, where a double meaning seems to be intended, while the recognition of an original literal sense, having no mystical meaning, afterward legitimately receiving an additional typical significance, is characteristic, e.g., of Gigot's interpretation.

Theodore of Mopsuestia (d. 429) refused to recognize any other than the literal sense. For this he was condemned by the council of Constantinople in 553. Some of the Anabaptists seem to have taken the same view. Sébastien Chateillon recognized the secular character of the poem, and for this offense he was driven out of Geneva through the influence of Calvin. Luis de Leon (d. 1591) made a Latin translation of it for a sister in a convent without suggesting any mystical sense, and was incarcerated by the Inquisition for five years as a punishment. Jean le Clerc maintained that only earthly love was depicted in the songs; and J. D. Michaelis, regarding the work as in part obscene, was unwilling to give it a place in his translation of the Bible. The growing conviction that the poet, or poets, had no other purpose than to depict the love of man and woman has not strengthened this feeling as regards the book; on the contrary there has been during the last century a decidedly higher estimate of its moral worth as well as a greater admiration of its literary charm.

On two important points there is as yet no consensus of opinion. Is Canticles a drama or a mere collection of lyrics? And is the love described that of husband and wife, a bridegroom and a bride, a betrothed couple, or only that of man and woman. Caspar Sanctius, in 1616, affirmed that Canticles was a sacred drama; Cornelius a Lapide (d. in 1637) divided it into five acts; Laurentius Petræus, a Danish pastor, arranged it in dramatic form, translated it metrically and set music to it in 1640; Huet, in 1670, declared it to be a drama; Hermann von der Hardt (before 1706), an anonymous Breslau pastor in 1720, G. Wachter in 1722, and Nicholas Nonnen in 1725 presented various attempts to indicate a plot. A shepherd lover as a rival of Solomon was introduced by J. F. Jacobi in 1771. While Franz Delitzsch gave the most perfect expression to the type of dramatic construction which made Solomon and Sulamith the real lovers, it was largely through Ewald that the idea of a heroine, faithful to her absent shepherd in the face of the blandishment of the infatuated despot, became widely popular. It furnished an ethical motive, presented a moral struggle and suggested the ultimate triumph of virtue. Duhm in 1902 and Driver in 1910 still adhere to this view. The chief difficulties that have been raised against it are that the ancient Hebrews possessed no theatre; Canticles has no plot, on which two interpreters can agree; Solomon's character and conduct are unintelligible; Sulamith's speeches, ostensibly answering his, in reality addressed to her absent friend, place her in an absurd situation and a morally dubious light; the tone of the King's words, those assigned to the shepherd, and those placed on her own lips is very much the same; and the necessity for putting her to sleep on the stage, to dream through entire scenes, is not less embarrassing because these scenes are so short that they can scarcely have occupied more than a minute or two.

Already Bossuet and Lowth suggested that Canticles may have been written for a royal wedding, and divided it in sections for the seven days of the festival. Renan (1860) threw out the idea that it may be the libretto of a simple play performed at some rural wedding, where the singers took the parts of Solomon's guards, ladies of Jerusalem and others. He was influenced by Charles Schefer who had seen such performances in Egypt and in Syria. In 1873 J. G. Wetzstein described, in an article on the «Syrian Threshing Table» a wedding at El Hamma, near Damascus. On the morning after the wedding night the husband and wife played king and queen, sitting upon the threshing table as a throne, dancing and listening to songs in their praise. At a Jewish wedding in Tunis similar ceremonies were observed by Saint Haon in 1882; though there was no sword-dance by the bride. Especially through Budde the view has gained much currency that Canticles is a collection of songs brought together by an old wedding poet from his lore. This scholar insists that throughout the collection wedded love is described. All pictures of natural scenery are covered allusions to the complete satisfaction of the sexual instincts in wedlock. The purpose is to commend matrimony. Against this view it has been urged that it is difficult to see wedded love in scenes which describe the husband, according to the theory, as knocking at his wife's window and being refused admittance because she is not dressed, or the wife as expressing a wish that he were her brother so that she might kiss him without being reproved.

According to Luis de Leon (1569), René Rapin (1659), Charles Cotin (1662), Richard Simon (1678), Jean le Clerc (1685), Claude

Genest (1707), J. T. Lessing (1777), J. G. Herder (1778), E. Reuss (1879), W. W. Baudissin (1901), L. Gautier (1906), Paul Haupt (1907), N. Schmidt (1911) and H. Gressmann (1913), Canticles is an anthology of love-songs, idyls, eclogues or madrigals. Reuss has especially called attention to the poet's peculiar manner of making the woman with whom he is in love the speaker by preference. There is an unmistakable similarity of this diwan to the «Anthologia Palatina.» Greek influence seems certain; it is not impossible that the poet had heard some idyl of Theocritus; and his sense of beauty in nature reminds of Meleager. Nevertheless, it may not be safe to go as far as to the reign of Aretas IV (c. 85–63 B.C.), while it would seem necessary to assume a date later than the 3d century B.C. The language, with its Aramaisms, neo-Hebraic turns, and Persian and Greek loanwords appears to be as late as the 2d century B.C. But if the author lived in the East-Jordan country this appearance may to some extent be due to dialectical differences. There is no hint that he was a married man, or a wedding poet. He did not sing to teach the value of a social institution, but to voice, in the most delicate and beautiful terms he could master, the joy with which the glories of spring and the impulses of love filled his heart. The mention of Solomon by way of comparison naturally led to the idea that he, who had so much experience with love, was the author, and Solomon's reputation for wisdom led to the search for a hidden meaning. This meaning made it appropriate to read the book at the Passover when the intimate relation between Yahwe and Israel was celebrated. There does not seem, therefore, to be any occasion on this account to suspect, as Erbt and Sellin do, that originally these songs were composed in honor of a sun-god and a moon-goddess whose nuptials were celebrated at the feast of the vernal equinox.

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CANTIUM, căn'tĭ-ŭm, England, an ancient territory in South Britain, whence the English word Kent is derived, supposed to have been the first district which received a colony from the Continent. See KENT.

CANTO FIGURATO, fē-gū-rä'tō, a term applied by the old Christian ecclesiastics to the chant in its more florid forms, or in which more than one note was sung to a syllable.

CANTON, John, English electrician: b. Stroud, 31 July 1718; d. 22 March 1772. He settled as a schoolmaster in London, and was elected a fellow of the Royal Society in 1749. He invented an electroscope and an electrometer; originated experiments in induction; was the first to make powerful artificial magnets; and in 1762 demonstrated the compressibility of water. He and Franklin discovered almost simultaneously that some clouds were charged with positive and others with negative electricity.

CANTON, William, English writer: b. Isle of Chusan, China, 27 Oct. 1845. He was educated in France for the Roman Catholic priesthood, but decided upon a secular career and was for many years on the staff of the Glasgow *Herald*. He is author of ‘A Lost Epic and Other Poems’ (1887); ‘The Invisible Playmate,’ a strikingly original piece of work (1894); ‘W. V., Her Book, and Various Verses’ (1896); ‘The Invisible Playmate, and W. V., Her Book’ (with final chapter) (1897); ‘A Child's Book of Saints,’ republished in the United States as ‘W. V.'s Golden Legend’ (1898); ‘Children's Sayings’ (1900); ‘A Child's Book of Warriors’ (1912); ‘Saint Elizabeth of Hungary’ (1912); ‘The Bible and the Anglo-Saxon People’ (1914).

CANTON, China (more correctly *Quangchow-foo*), a large and important city on the Pearl River, at a distance of 80 miles from the sea. It is situated in the province of Quangtung (of which name Canton is a corruption), and consists of the city proper and of many suburbs, and its total population is estimated at from 1,250,000 to 1,800,000 with 500 foreign residents. The city proper is enclosed by walls, forming a circuit of six miles, and is divided into two parts by a partition wall running east and west; the portion north of this wall, which is much the larger, being called the old, that on the south of it the new city. The walls mainly of brick, rise to the height of 25 feet, with a thickness of about 20 feet. There are 12 gates, all of which are shut at night. The streets are long and straight and in general paved with flat stones, but they are very narrow, the average breadth not exceeding eight feet. The houses of the poorer classes are mere mud hovels; those of the shopkeeping class are commonly of two stories, the lower of which serves as the shop. The streets are to a great extent lined with these shops, in which are to be found the productions of all parts of the globe. Neat and gaudily painted signs and names give a gay appearance to the narrow streets; in most cases there are no windows in front, but the whole is thrown open by day and closed at night. Temples and other religious edifices are very numerous, but few of them are in any way remarkable. There are two lofty pagodas, forming a notable feature in any general view of the city. One of these, 170 feet high, is about 1,300 years old, the other, 160 feet high, about 1,000. Among the chief temples, which are far from attractive buildings, may be mentioned those of the Ocean Banner, of the Five Hundred Gods, of Longevity and of the Five Genii. Among other buildings may be mentioned the residences of the governor-general, the commander-in-chief, the treasurer, the prefect, etc. There are four large prisons, one of them capable of holding 1,000 prisoners. In the European quarter are churches, schools and other buildings in the European style. Wheeled carriages are not in use in Canton; goods are transported on bamboo poles laid across the shoulders of men, while people who can afford it have themselves carried about in sedan-chairs. The river opposite the city for the space of four or five miles presents a most interesting scene. The prodigious number of boats with which it is crowded is the first thing that strikes the eye. A large number of these — as many, it is said, as 40,000, containing a population of 200,000 — are fixed residences, and most of them moored stem and stern in rows. The inhabitants are called tankia or boat-people, and form a class with many customs peculiar to themselves. Millions are born and live and die in these floating dwellings without ever having put foot on dry land; while their ancestors for generations were all amphibious like themselves. The family boats are of various sizes, the better sort being from 60 to 80 feet long, and about 15 feet wide. A superstructure of considerable height, and covered with an arched roof, occupies nearly the whole of the interior of the boat. This structure is divided within into several apartments, devoted to different domestic purposes, all of them being kept very clean. The smaller boats of this description are not above 25 feet long, and contain only one room. By far the handsomest boats are the hwa-ting or flower-boats, which are graceful in form and have their raised cabins and awnings fancifully carved and painted. These are let to pleasure-parties for excursions on the river. The foreign mercantile houses and the American, British and French consulates have as their special quarter an area in the suburbs in the southwest of the city, with water on two sides of it. The river banks are faced with a granite wall; handsome hongs or factories have been built, and much money has been spent on improvements. The manufactures and other industries of Canton are varied and important, embracing silk, cotton, porcelain, glass, paper, sugar, lacquered ware, ivory carving, metal goods, etc. Its foreign trade has been known for three centuries throughout the world, and it was the chief foreign emporium in China until 1850, when Shanghai began to surpass it. Since then the opening of other ports and various other causes have interfered with its prosperity, but it still carries on a large traffic, its exports and imports together amounting in 1912 to about $50,000,000, and its total trade to upwards of $70,000,000. Business transactions between natives and foreigners are transacted in a jargon known as "pidgin-English." Since the establishment of the colony of Hongkong there has sprung up quite a flotilla of river steamers, which ply daily between Canton, Hongkong and Macao, and convey the greater part of the produce and merchandise for native and foreign consumption. These steamers equal the best river boats of Europe, and carry large numbers of passengers. The climate of Canton is healthy; in July and August the thermometer may rise to 100° F. in the shade, and during winter it is at times below freezing-point. Canton was first visited by English vessels in 1634. From 1689 to 1834 the East India Company had a monopoly of the English trade. In 1839 war was declared by Great Britain against China, and Canton would have been occupied had it not been ransomed by the Chinese. In the war of 1856 the foreign factories were pillaged and destroyed, and about a year after this Canton was taken by an English force. From this time to 1861 it was jointly occupied by an English and French garrison. Since then it has been open to foreign trade. Of revolutionary movements that have affected the political life of China Canton has been the centre.

CANTON, Conn., town, Hartford County, on Farmington River and on the Central New England Railroad, 15 miles northwest of Hartford. The manufacture of edged tools and the bottling of plain and carbonated waters are thriving industries. The town includes the village districts of Canton, Canton Centre, North Canton and Collinsville. Pop. 2,732.

CANTON, Ill., city of Fulton County, situated on the Chicago, B. & Q. and the Toledo, P. & W. railroads, 28 miles west of Peoria. It is the trade centre of the fertile agricultural and coal-mining region; and has numerous industrial interests, including a large manufactory of agricultural implements, cigar factories and several lesser plants. The United States census of manufactures for 1914 reported 34 industrial establishments of factory grade, employing 1,113 persons, of whom 920 were wage earners, receiving $829,000 annually in wages. The capital invested aggregated $9,733,000, and the year's production was valued at $2,577,000: of this, $1,451,000 was added by manufacture. It has a public library, a high school and municipal waterworks. Canton was settled in 1832, first incorporated in 1849 and is governed under a charter of 1892, providing for a mayor, elected every two years, and a city council. Pop. 12,000.

CANTON, Mass., town in Norfolk County, about 15 miles southwest of Boston, on the New York, New Haven and Hartford Railroad. It includes several villages. The town contains a public library, the Massachusetts Hospital School and has manufactories of felt goods, cotton padded goods, blacking, woolens, rubber goods, patent and enameled leathers, electrical supplies, fire hose, etc. Canton was settled about 1690 and was separated from Stoughton in 1797 and incorporated. The waterworks are the property of the town, the government of which is carried on by town meetings. Pop. 4,797. Consult Huntoon, 'History of the Town of Canton' (Cambridge 1893).

CANTON, N. Y., village and county-seat of Saint Lawrence County, on Grass River, and the Rome, W. & O. Railroad, 59 miles northeast of Watertown. It is the seat of Saint Lawrence University, a State school of agriculture, a government weather bureau, and has large flour and lumber interests, boat building industries, a national bank, a public library, county almshouse, several churches and an assessed property valuation of over $3,000,000. Canton was settled in 1803 and incorporated in 1846. Pop. 3,000.

CANTON, Ohio, city, county-seat of Stark County, on the Nimishillen Creek, and on the Pennsylvania, Wheeling & Lake Erie, Baltimore and Ohio railroads, 60 miles southeast of Cleveland. Interurban electric railroads connect all cities and towns within a radius of 50 miles. The commercial centre of the second richest agricultural county of Ohio, also ranking among the six richest of the nation, Canton has an extensive grain trade, and manufactures of brick, sheet steel and iron, watches, enamel ware, roller bearings, safes, bridges, toys, knives, etc. The total manufacturing output is valued at $52,000,000 annually. Neighboring deposits of coal, limestone and pottery clay are also extensively worked. An immense plant supplies electric light and power, natural gas is piped at a domestic rate of 30 cents; an artesian water supply is maintained and operated by the municipality, and a fire department with a modern motor-equipped apparatus. Bank clearings in 1915 amounted to $95,873,208, an increase of $16,000,000 over 1914; bank deposits totaled $27,000,000, resources over $30,000,000. Canton was the home of President McKinley and one of the city's features is the stately National memorial erected in 1907 on Monument Hill in West Lawn Cemetery, where the President and his wife are buried. Of granite, with a bronze statue of the President and with two sarcophagi containing the bodies, the monument stands in beautiful grounds covering 26 acres; from the lowest step it reaches a height of 163 feet 6 inches and 78 feet 9 inches in diameter. The memorial to the American soldiers of the Spanish-American War is also noteworthy. The city's principal buildings include the Federal building, city hall, city auditorium, county administration building, public library, high and other schools, several theatres, numerous handsome churches which cost $250,000, membership 1,500. Nimisilla park and Meyer's Lake park are attractive outing resorts. Canton was settled about 1805, was incorporated as a village in 1822 and received a city charter in 1854. It is administered by a mayor and nine aldermen, elected under a law of 1902.

CANTON, S. D., city, capital of Lincoln County, on the Chicago, M. & Saint P. Railroad, and on the Sioux River, 20 miles from Sioux Falls, is the seat of Augustana College and of the government asylum for insane Indians. The city owns its waterworks and has a Carnegie library, a handsome courthouse, churches, public schools and important manufactures of concrete, engines and agricultural implements. The commission form of government exists since 1909. Pop. (1910) 2,103.

CANTON, a small division of territory, constituting a distinct state or government, as in Switzerland, where each of the 22 states is so designated. In France judicial districts comprising a number of communes, but constituting in the case of very large cities only a part of such commune, are called cantons.

CANTONI, kän-tō'nē, **Carlo,** Italian philosopher: b. Gropello 1840; d. 1906. He studied law and philosophy at Turin, and philosophy at Berlin and Göttingen (under Lotze). He was professor at the lyceum at Turin, and in Milan; since 1878 he has been professor of philosophy at the University of Pavia. In his philosophical theory he agrees in general with Kant, except his theory of phenomenon and noumenon. He wrote 'G. Battista Visco, studii virtu e comparazione' (1867); 'Corso elementare di filosofia' (1870); 'Giuseppe Ferrari' (1878); 'Emanuele Kant' (1879–84).

CANTONMENT, the district in which troops are quartered when they are not collected into a camp, but detached and distributed over the neighboring towns and villages. The object of sending troops into cantonments is to be able to concentrate them as quickly as possible on one spot, when circumstances do not admit of a camp being formed, or do not render it advisable to form one. In India the permanent military stations erected in the neighborhood of the principal cities are so called. The larger types contain barracks for European cavalry, infantry and artillery, houses for officers, huts for native troops, gymnasiums, storehouses, parade grounds and administrative buildings.

CANTOR, Georg, Russo-German mathematician: b. Saint Petersburg 1845. After 1879 when he became professor of mathematics at the University of Halle, he originated the theory of assemblages or systems of numbers which may contain — as does the universe — a finite or an infinite number of numbers, or an infinity of such infinities; this last class he termed transfinite numbers and made a classification of the systems, relating the potency or degree of infinitude of each. His learned contributions appear chiefly in the *Mathematische Annalen.*

CANTOR, Moritz, German mathematician: b. Mannheim 1849. From 1853 he was professor of mathematics and privat-docent in the University of Heidelberg and became widely known by the standard 'Geschichte der Mathematik'— History of Mathematics, which brings the subject down to the year 1799 (4 vols., Leipzig 1880–1909).

CANTU, kän'too, **Cesare,** Italian historian, poet and philosopher: b. Brivio, 7 Dec. 1804; d. 11 March 1895. He was educated at Sondrio in the Valtellina, where he taught *belles-lettres* at a youthful age, resided afterward in Como, and next at Milan until 1848. One of his earliest works, entitled 'Ragionamenti sulla Storia Lombarda nel Secolo XVII' ('Lectures on the History of Lombardy in the 17th Century') appeared in a second edition in 1842–44, and contained liberal ideas that brought upon the author the animadversion of the Austrian government, which condemned him to a year's imprisonment. During his confinement he composed a historical romance, entitled 'Margherita Pusterla' (1845), which became very popular. His great work, on which his reputation will chiefly rest, 'Storia Universale' ('Universal History') appeared first in 1837, at Turin. It has been since revised and reprinted at Palermo and Naples, and translated into German. A French translation by Aroux and Leopardi was published in Paris in 1843. Cantu became director of the archives of Lombardy in 1874. Other works are 'Storia degli Italiani' (1854); 'The Last One Hundred Years' (1864); 'The Italian Heretics' (1866–68), and monographs on various men of letters. Consult Bertolini, 'Cesare Cantu e le sue opere' (1895). See MARGHERITA PUSTERLA.

CANTUS FIRMUS, an ancient chant of the Roman Catholic Church. These chants were adopted as standing melodies, and until counterpoint was discovered, were unaccompanied, or only harmonized with octaves.

CANUCK, a term sometimes used in the United States to denote a Canadian.

CANUTE IV, Saint, King of Denmark 1080–86. He suppressed the ancient heathen customs of his people, and thus aroused opposition; in 1085 he started on an expedition against William the Conqueror, but was murdered by rebels in his own army in 1086. He was canonized in 1100 and in the Middle Ages was considered the patron saint of Denmark.

CANUTE, kä-noot', **THE GREAT, Knud,** or **Knut,** the second king of Denmark of that name, and first Danish king of England: b. in the former country, about 995; d. Shaftesbury, England, 1035. He was the son of Sweyn, King of Denmark, and accompanied his father in his victorious campaigns in England. Sweyn, having proclaimed himself king of England, died in 1014, before his power was established, and appointed Canute his successor there. The latter was immediately driven out by Ethelred, the representative of the Saxon line, and fled with 60 ships to the court of his brother, Harold, king of Denmark. Harold enabled him to collect a large fleet in the north to prosecute his cause in England. He invaded that country anew in 1015. He fought many battles with Edmund Ironside, who had succeeded his father, Ethelred, in 1016, and was finally victorious at the battle of Ashington. After this battle, Edmund and Canute agreed upon a division of the kingdom. To Canute were assigned Mercia and Northumbria, while the Saxon Prince reserved West and East Anglia. By the death of his brother Harold, he obtained the crown of Denmark (1016). In the same year, and but one month after the ratification of the treaty of partition, Edmund died, and Canute became sole king of England without further resistance. He refrained from murdering the children of his late rival, and sent them to his half-brother, Olave, king of Sweden. He put away his wife, Alfgive, the daughter of the Earl of Northampton, and espoused Emma, the widow of Ethelred, the Saxon monarch (1017), on the condition that their children should succeed to the throne of England. He made the greatest exertions to gain the affections of his English subjects, to whom his Danish origin was no recommendation. He accordingly disbanded his Danish army, retaining only a body-guard. He endeavored to blend the two races as far as possible and to induce them to live in harmony with each other. He erected churches, and made donations to abbeys and monasteries on the scenes of former conflicts and massacres. In a witenagemote at Winchester, he compiled a code of laws which is still extant. In this code he denounced those who kept up the practice of pagan rites and superstitions, and forbade the sending of Christian slaves out of the country for sale. Although Canute generally resided in England, he made frequent visits to Denmark. He carried with him on these occasions an English fleet, English missionaries and English artisans. He promoted three Englishmen to the newly-erected bishoprics of Scania, Zealand and Fionia. In 1025 he was attacked by the King of Sweden and defeated; but in the night, Earl Godwin, at the head of the English contingent, surprised the Swedish camp and dispersed the enemy. His absence from Denmark, and the bestowal of so many dignities in Denmark upon his English subjects, made him unpopular in that kingdom. To appease this discontent, he left behind in Denmark his son, Hardicanute, then aged 10 years, under the guardianship of his brother-in-law, Ulf (1026). In this year he made a pilgrimage to Rome. He was well received there by the Pope, John, and by the Emperor, Conrad II, who gave up to the Danish King all the country north of the river Eider. From the Pope he obtained privileges for the English school established in Rome, and an abatement of the sums demanded from his archbishops for the pallium; and from the various princes, relief for all English and Danish pilgrims and merchants from all illegal tolls and detentions which they had endured on their route to Rome. He returned from Rome to Denmark. In 1028 he made an expedition into Norway, expelled Olave and restored Haco who swore allegiance to him. In 1029 he returned to England, and his Danish subjects proclaimed Hardicanute king of Denmark. Canute immediately returned to Denmark, put down the revolt and executed the traitor, Ulf. In 1030 Canute was acknowledged king of Norway, and laid claims to the crown of Sweden. On returning again to England, he allowed his son Hardicanute to share with him the Danish crown. His reign is very important in the constitutional history of Denmark. Canute issued the first national coinage of Denmark, and published the first written code of Danish law wherein the custom of private vengeance was prohibited. He raised the clergy in their corporate capacity to a separate estate of the realm, and instituted the Thinglith or royal guard of 3,000 men. The members of this body were all men of good family and rich enough to equip themselves at their own expense. From them sprang the Danish order of nobility; they were tried only by their peers and formed with the king the highest court of justice. Canute's last compaign was against Duncan, king of Scotland, respecting the possession of Cumberland, but before the armies could engage the two kings were reconciled, and ancient stipulations concerning the tenure of Cumberland were renewed (1033). Canute was buried at Winchester. By Emma he had two children, namely, Hardicanute or Canute the Hardy and a daughter, Gunhilda, married to Henry, the son of Conrad II, of Germany, Emperor. By Alfgive he left two sons, Sweyn and Harold. To Sweyn was given the crown of Norway; Hardicanute retained that of Denmark, and Harold, surnamed Harefoot, took possession of that of England. Canute is most popularly known, not by his extended rule and legislative enactments, but by the familiar story of the monarch, the courtiers and the disobedient sea. Consult Larson, 'Canute the Great' (New York and London 1912); Freeman, 'The Norman Conquest' (Vol. I, Oxford 1870); Green, 'The Conquest of England' (London 1883).

CANVAS, a textile fabric made of the fibres of hemp; or any strong, firm cloth, whether of hemp or flax. It is chiefly used for tents, and for the sails of sailing vessels, for which its strength makes it well adapted. Canvas for sails is made from 18 to 24 inches wide, and numbered 0 to 8, No. 0 being the thickest. A bolt is 39 to 40 yards long, and weighs 25 to 48 pounds. Varieties of it are also used as the ground of tapestry work and of oil paintings. A finer description is used for many common domestic purposes, as for towels, table-cloths, etc. The canvas used by artists is commonly of linen, varying in size and thickness, stretched on a frame or «stretcher,» and made tight by «keys» or wedges inserted in the four inside corners. There are several sizes of canvas which are generally used and are kept stretched.

CANVAS-BACK, a widely distributed fresh-water duck (*Aythya vallisneria*), much sought as a table luxury, as its flesh is considered superior to that of all other ducks. It is about 22 inches in length and its reddish-chestnut head and neck are much shaded with dusky hues; the lower neck, breast and fore-part of the back, with the rump and tail-coverts, are black; and the back and sides gray, covered with fine lines and dots, so that the plumage resembles canvas. By reason of its similarity, this duck is frequently confounded with the red-head (q.v.). «The canvas-back is larger, its head darker, and its bill a deep black, while that of the red-head is deep blue, or a slatish color. The shape of the bill of the canvas-back is wedged and long; of the red-head moderately long and concave. . . . They are very tenacious of life, their bump of stubbornness being fully developed, and they will dive long distances, and prefer death by any other means than human agency. When one is crippled it will usually look around for an instant, to see where the danger lies, then down it goes, and if rushes or cover are near, it is good-bye to that duck,—it will not be seen again. When one is crippled it should be shot again, and at once.» The food of the canvas-back consists chiefly of the roots of wild celery (*Zostera vallisneria*), which resembles the cultivated celery in appearance. It grows densely in the shallow parts of the Chesapeake Bay and Susquehanna River about the Great Lakes and in the Mississippi Valley. Few canvas-backs are found east of the Hudson and Delaware rivers. It is almost safe to say that where the plant grows in abundance, the canvas-back is almost sure likewise to be found; consequently the peculiarly delicate flavor of its flesh, and the market value of this duck, increase with the amount of celery it consumes, as otherwise it is hardly distinguishable from the red-head in flavor. The canvas-back breeds north of Dakota, building its nest on the ground, in a marsh, and laying from 6 to 10 greenish-buff eggs. Consult Elliot, 'Wild Fowl of North America'; Job, 'Among the Wild Fowl.'

CANYON, kàn'-yôn, a valley that is notably deep in proportion to its width. The average idea as to the depth of canyons is much exaggerated, however. Most canyons are much wider than they are deep. The Grand Canyon of the Colorado is as much as 10 miles wide at many points, and averages only about a mile deep, and yet it is one of the most stupendous chasms in the world. In rare cases gorges are deeper than they are wide, but this is the exception. Since the work of a river is not only to cut a valley but to carve away the entire surrounding region, it is evident that canyons represent a youthful stage in river erosion, before there has been time to widen the valley. See GRAND CANYON OF COLORADO.

CANYON DE CHELLY (Shay), Ariz., a canyon in the Navajo Indian Reservation in the northeastern corner of the State, famous for its picturesque walls and monuments of red sandstone. Two branch canyons, del Muerto and Monument, are similar. The walls are from 800 to 1,200 feet high and while mostly vertical, present many erosion forms. The canyons have been cut by creeks rising in Chuska Mountains on or near the Arizona-New Mexico State line. The rock is a light red massive, crossbedded sandstone locally developed between Shinarump conglomerate above and Moenkopi formation below, possibly of Permian age. Some notable cliff dwellings remain in the canyon walls. These wonderful canyons can be easily visited by leaving the Santa Fé Railroad at Gallup, taking automobile 70 miles to Chinlee and there obtaining horses for a 35-mile round trip. The canyon was discovered by Doniphan's expedition in 1847 and Simpson who visited the place in 1850 obtained the name from Sr. Vigil, secretary of the province of New Spain. It is believed to be a Spanish version of the Navajo term, *Tse-yi*, meaning «in the canyon.»

CANYON DIABLO, a noted canyon crossed by Santa Fé Railroad in eastern Arizona. It is 225 feet deep, with steep, step-like walls of the limestone which constitutes the adjoining platform. It was cut by a small stream, tributary to the Little Colorado River, which is not far north.

CANZONE, kän-tsŏ'nă, a particular variety of lyric poetry of Provençal origin. It is found in the Italian poetry of the 13th century. At first it was quite irregular, but was confined by Petrarch to more fixed and regular forms. Hence it is called canzone Petrarchesoa; it is also called canzone Toscana, because it originated in Tuscany. It is divided into several stanzas, in which the nature and disposition of the verses, which are of 11 and 7 syllables, and the place of the rhymes, are uniform. The canzone-strophe consists of two parts, the opening one being distinguished by Dante as the *fronte*, the closing one as the *sirma*, and these parts are connected by rhyme, it being usual to make the rhyme of the last line of the *fronte* identical with that of the first line of the *sirma*. In other respects, the canzone has great liberty. The canzone usually concludes with a stanza which is shorter than the others, and is called ripresa, congedo, comiato, signifying dismission or taking leave. There are different kinds of canzoni, and different names are given to the different parts. The canzone Anacreontica is divided into small stanzas, consisting of short verses, with a regular disposition of the rhymes through all the stanzas. Not only light, pleasing songs of love, gaiety and mirth, but poems on solemn and lofty subjects, and of an elevated dithyrambic strain, are included under this name. The latter subjects, however, are better adapted to the canzone Pindarica, which was first introduced in the 16th century by Luigi Alamanni, and owes its perfection chiefly to Chiabrera. It is distinguished from that of Petrarch by a bolder flight, loftier ideas, greater freedom in the choice and disposition of the verses, and by the form of the stanzas, which is borrowed from the Greek chorus. The Pindaric canzoni are divided into strophe, antistrophe and epode, and are called canzoni alla Greca. Those divisions are sometimes called ballata, contraballata and stanza: or volta, rivolta and stanza; the Greek names are the most common. There is also the canzone a ballo, an old Italian poem, originally intended to be sung at a dance (ballo). It is called also ballata. It is not employed by the Italian poets later than the 16th century. In England, the canzone was introduced at the end of the 16th century by William Drummond of Hawthornden, who has left some fine examples. In Germany, the poets of the Romantic period imitated it, especially A. W. von Schlegel.

CANZONET, kăn-tsŏ-nĕt', **CANZONETTA,** in Italian poetry a canzone (q.v.) consisting of short verses, much in use with the poets of the 15th century. Rinuccini, and after him Chiabrera, have used it in modern times, and given it more grace. Canzonets are generally expressive of tender feelings. In music, canzonet signifies a song, shorter and less elaborate than the aria of the oratorio or opera.

CAONABO, kä-o-näbō', Indian chief of Hispaniola (Haiti) at the time of its discovery by Columbus: d. 1496. The latter built a fort which he called La Navidad, and in which he left, when sailing for Spain early in 1493, a garrison of 40 men. Returning before the end of the year, he found that Caonabó had burned the fort and killed the garrison. According to the account of a friendly native, the Spaniards had drawn this fate upon themselves by their evil conduct. In 1494 the Indians in great numbers attacked the Spaniards, having been provoked by the misconduct of one of the lieutenants of Columbus, Pedro Margarite. Columbus overthrew them, first at Magdalena, and later (1495) on the plains of the Vega Real — where, tradition has it, 100,000 hostiles were assembled. Caonabó meanwhile threatened the garrison of Saint Thomas. Alonzo de Ojeda was sent by Columbus to cajole Caonabó into coming to a conference. Ojeda went alone among the hostiles. As presents he took gyves and manacles of shining metal; treacherously persuaded the Prince to show himself to his subjects wearing these novel ornaments, and even, while thus adorned, to ride Ojeda's horse; then, mounting also, he dashed through the crowd of savages and carried his victim into the presence of Columbus. He was sent to Spain for trial and died en route.

CAOUTCHOUC, koo'chook, an elastic, gum-like substance, obtained from the juice of certain tropical trees and shrubs, and commonly known as India-rubber or "rubber." The best caoutchouc comes from the Pará region, in Brazil; but supplies are also obtained from Central America and the West Indies, from Africa and from tropical Asia, especially from Ceylon and Malaya. The details of collecting the juice and preparing it for market vary somewhat according to the locality, and with the nature of the trees or shrubs from which the juice is obtained. In the Amazon region, when the source is a tree, incisions are made in the bark each morning, and the milky sap that exudes is collected in little tin or clay cups that are secured to the tree for the purpose. At the end of about 10 hours these are emptied into larger collecting vessels, and on the morning of the following day new incisions are made in each tree, some eight inches below the first ones. This process is continued until incisions have been made in the bark from a height of about six feet down to the ground. The poorest quality of sap is obtained from the highest wounds, and the best from the lowest ones. To evaporate the juice, a fire is first built of materials that yield dense volumes of smoke. A workman then dips a wooden paddle into the collected sap, after which he holds it in the smoke until the sap solidifies and acquires a slight tinge of yellow. He then dips the paddle into the sap supply again, repeats the smoking process, and so proceeds until the paddle is covered with a layer of the dried gum that is perhaps an inch and a half thick. He then slits this layer, removes it from the paddle, hangs it up to dry, and starts a fresh evaporation.

Pure caoutchouc from Pará is light-colored below the surface, but superficially it is dark-brown from oxidation. It has a specific gravity of about 0.92, and consists chiefly of carbon and hydrogen in the proportion of about 87 per cent of carbon to 13 of hydrogen. Small quantities of oxygen are always present, however, as the best of the Pará product contains as much as one-half of 1 per cent of a sort of resin that contains oxygen, and is undoubtedly produced by the oxidation of the gum. In fact, it is known that caoutchouc will oxidize slowly in damp air, even after it is vulcanized, and particularly when exposed to the action of light. Caoutchouc consists, apparently, of two different kinds of gum, one of which is fibrous, while the other is viscous, though the two are chemically identical. It is slightly soluble in ether, turpentine, chloroform, petroleum, naphtha, benzine, and carbon disulphide, the viscous portion being more soluble than the fibrous part. At 250° F. caoutchouc begins to melt, and becomes permanently transformed into a sticky substance which retains its peculiar consistency almost indefinitely. At 400° F. the transformation is more complete, and the black, adhesive mass that results makes an excellent lute for sealing glass bottles and jars if it is thoroughly incorporated with 50 per cent of its own weight of dry slaked lime. By careful destructive distillation caoutchouc is resolved into a number of hydrocarbon oils that are of interest to the chemist.

As early as 1615 the Spaniards used the crude gum "for waxing their cloaks, which were made of canvas, so as to make them resist water." But it was not until about 200 years later that caoutchouc began to attract general attention in such ways. At first it was applied to cloth by the aid of heat; but improved methods followed the discovery of solvents for the gum, and the invention, by an Englishman named Thomas Hancock (about 1820), of the "masticator," a machine by which the caoutchouc is thoroughly worked over and brought to a uniform consistency. But the greatest step in the development of the rubber industry was the discovery of the process of vulcanization,— a discovery that appears to have been made independently and at about the same time (1843) by Charles Goodyear, of New Haven, Conn., and Thomas Hancock, to whom reference has previously been made. The credit of priority belongs to Goodyear, but Hancock did a great deal to make the discovery a commercial success. Unvulcanized caoutchouc is softened by heat, and is made hard and inelastic by cold; but upon being vulcanized the gum becomes comparatively insensible to ordinary extremes of temperature, and also has its elasticity materially increased. The process of vulcanization depends upon the fact that the crude rubber will absorb sulphur, and combine with it at a temperature that is easily attainable without injury to the product. The details of the vulcanization differ somewhat, according to the nature of the article that is being manufactured. If sheet rubber is submerged for a few moments in melted sulphur at a temperature of 250° F., it absorbs about one-tenth of its weight of that element; but although its color changes somewhat, it is otherwise apparently unaltered. Upon exposure for a somewhat longer time to a temperature of 285° F., however, true combination of the sulphur and caoutchouc ensues, and the gum is said to become "vulcanized." It is not necessary that the sulphur should be actually melted in order that the sheet rubber may absorb it, for sheets that are laid in powdered sulphur that is heated nearly to its melting-point will absorb the proper amount for good vulcanization in the course of a few hours. Vulcanization of rubber sheets can even be brought about without the action of heat, by dipping the sheets for a few seconds in a solution of chloride of sulphur in carbon disulphide. It is more common, however, to knead the requisite amount of sulphur directly into the caoutchouc by mechanical means. The article to be manufactured is then brought into shape by the action of pressure and moderate heat (or in any other manner), and the final operation consists in heating it to the vulcanizing temperature by the aid of a steam bath. Chemically considered, the process of vulcanization appears to consist in the substitution of one or more sulphur atoms for a portion of the hydrogen of the hydrocarbons of which the caoutchouc is composed. For many years chemists have been interested in synthetic rubber to take the place of natural caoutchouc, but the artificial product has not yet come into extensive use. See INDIA RUBBER; RUBBER MANUFACTURE.

CAP, the cover of the end or head of anything. Caps were not worn by the Romans for many ages. When either the rain or sun was troublesome the lappet of the gown was thrown over the head; and hence all the ancient statues appear bareheaded, excepting sometimes for a wreath or the like. The same usage prevailed among the Greeks, to whom, at least during the Heroic Age, caps were unknown. The sort of caps or covers of the head in use among the Romans on divers occasions were the *pitra, pileus, cucullus, galerus* and *palliolum,* which are often confounded by ancient as well as modern writers. The general use of caps and hats is referred to in the year 1449. The first seen in Europe were used at the entry of Charles VII into Rouen. From that time they began to take the place of *chaperons* or hoods. When the cap was of velvet they called it *mortier;* when of wool simply *bonnet.* None but kings, princes and knights were allowed to use the *mortier.* The cap was the head-dress of the clergy and graduates. Pasquin says that it was anciently a part of the hood worn by the people of the robe; the skirts whereof being cut off, as an encumbrance, left the round cap an easy, commodious cover for the head; which cap, being afterward assumed by the people, those of the gown changed it for a square one, first invented by a Frenchman called Patrouillet. He adds, that the giving of the cap to the students in the university was to denote that they had acquired full liberty, and were no longer subject to the rod of their superiors, in imitation of the ancient Romans, who gave a *pileus* to their slaves in the ceremony of making them free: whence the proverb *vocare servos ad pileum:* hence, also, on medals, the cap is the symbol of Liberty, who is represented holding a cap in the right hand by the point.

Cap of Maintenance, one of the ornaments of state carried before the sovereigns of England on the occasion of their coronation. It is also applied to an ornament borne before the mayors of certain cities on state occasions, and to a device in heraldry.

In ship-building a cap is a square piece of timber having two holes cut through it,— one square, to fit on the squared or tenon head of the lower mast; the other round, to take the heel of the upper mast. Also a similar contrivance affixed to the end of the bowsprit, through a round hole in which the jib-boom is rigged; and a covering of metal or tarred canvas to protect the end of a rope from fraying.

In mining a mass of unproductive rock overlying valuable ore. In coal mining, the bluish halo of ignited gas which appears above and around the flame of a safety-lamp when a dangerous amount of fire-damp is present. In physical geography a similar mass, as of ice overlying the surface of a country; as, the ice-cap of Greenland. The word is also used in carpentry, in book-binding, in machinery and in ornithology to denote coverings for protection. The term as used in military parlance is percussion cap, a small copper cup containing fulminating powder, used in a percussion lock to explode gunpowder.

CAPANEUS, one of seven legendary heroes who warred against Thebes, killed by Jupiter.

CAP-À-PIE, kăp'ȧ-pē' (O. Fr. *de cap à pie*; Mod. Fr. *de pied en cap*), a term signifying from head to foot, and used with reference to a complete suit of armor covering the body of a knight at all points; as, «He was armed cap-à-pie for the encounter.»

CAPE ANN, Mass., the southeast point of the town of Gloucester, Mass., 31 miles from Boston, the northern limit of Massachusetts Bay; in lat. 42° 38′ N., and long. 70° 34′ W. The whole of the rocky peninsula forming this part of Gloucester is also called Cape Ann, including the village of Squam in its northeastern part. This peninsula is a headland of syenite, which forms low hills, over the surface of which the rock is very generally exposed to view. It projects about 10 miles into the Atlantic Ocean. Valuable quarries of syenite for building purposes are worked most conveniently for shipment. The place is much exposed to the prevalent northeast storms; but it offers a small, well-sheltered harbor among the rocks, where coasting vessels often take refuge. There are on the shores of this harbor two fixed lights about 165 feet above mean high water, and visible for 19 nautical miles; there is also a 10-inch steam fog whistle. The south and east shores have many attractive summer resorts.

CAPE ANN SETTLEMENT, the first within the limits of the Massachusetts Bay territory. In 1622, the New England Company, to push the settlement of its grant and give it some value, divided the land in severalty among its members. The region about Cape Ann fell to Edmund, Lord Sheffield, who sold a patent for it in 1624 to Robert Cushman and Edward Winslow of the Plymouth colony. They found some English hunters and fishers who had been there since the year before; these acknowledged the rights of the Plymouth people, and the two parties planted and fished amicably; but shortly after a London vessel which had taken up the quarrel of the firebrand, Rev. John Lyford, seized the Plymouth men's fishing stage. Miles Standish came up from Plymouth to settle the trouble by force, but against his wish the settlement compromised the matter by the crew agreeing to build them another stage. In 1624 Winslow's company sold the site of Gloucester to the «Dorchester Adventurers,» an unincorporated English joint-stock company recently formed. These had anticipated the bargain by sending out a band of settlers the fall before, with live stock, implements, etc., and they made Thomas Gardner overseer. The attempt was unsuccessful, and in 1625 the Dorchester company engaged Roger Conant, then at Nantasket with Lyford, to be governor, Lyford to be minister. But the next year the «Adventurers» dissolved, and most of the settlers went home; the few remaining ones, however, removed to «Nahumkeike» (Naumkeag), where they founded Salem.

CAPE ARAGO, or GREGORY, a cape on the western coast of Oregon, on the south of Coos Bay in Coos County. Its lighthouse, which is on a small island, is at lat. 43° 20′ 38″ N., and long. 124° 22′ 11″ W., and shows a white, flashing light 84 feet above sea-level.

CAPE or POINT BARROW. See Barrow, Cape or Point.

CAPE BLANCO, Africa. See Blanco, Cape.

CAPE BLANCO, Ore., a cape forming the most western point of the State, situated in lat. 42° 50′ N., and long. 124° 37′ W. It has a lighthouse with a white fixed light 256 feet above sea-level.

CAPE BOEO, bō-ā'ō, or **LILIBEO**, the ancient *Lilybæum Promontorium*, a cape, on the western coast of Sicily, one mile from Marsala. It is the point of Sicily nearest to ancient Carthage, and at an early period became an important naval station. The naval victory of the Romans over the Carthaginians, which put an end to the first Punic War, was gained near this point.

CAPE BOJADOR, bŏj-ą-dōr'. See Bojador, Cape.

CAPE BON, or RAS ADDER, a headland of Tunis, on the Mediterranean, forming the northernmost point of Africa, in lat. 37° 6′ N. and long. 11° 3′ E., and a few miles north of the town of Kalibia.

CAPE BRETON, bret'ŭn, Canada, an island of the Dominion of Canada, separated from Nova Scotia, to which province it belongs, by the narrow gut or strait of Canso; area 3,120 square miles; length about 110 miles. It is of very irregular shape, the Bras d'Or, an almost landlocked arm of the sea (with most picturesque scenery), penetrating its interior in various directions, and dividing it into two peninsulas connected by an isthmus, across which a canal has been cut. The surface is rather rugged, and only small portions are suited for agriculture; but it possesses much timber. The chief towns are Sydney and Arichat.

The mineral deposits are very rich; iron and copper ore is abundant, and over 400 square miles is underlaid with seam upon seam of valuable bituminous coal. The Dominion Steel Corporation had in 1912 over 10,000 men on its pay roll in and about the mines in Cape Breton discovered by John Cabot in 1497, and originally part of the French possession of Acadia; it was captured by the New Englanders in 1745, retroceded under the Treaty of Aix-la-Chapelle in 1748 and became a British possession under the Treaty of Paris in 1763. It was governed as a separate province from 1784 to 1820. It is divided into four counties, Richmond, Inverness, Victoria and Cape Breton.

CAPE CANAVERAL, a cape on the eastern coast of Florida, in lat. 28° 27′ N. and long. 80° 33′ W. There are dangerous shoals at this point, and navigation is protected by a revolving light 137 feet above sea-level and a coast signal station.

CAPE CANSO, the eastern extremity of Nova Scotia, at the southern entrance of Chedabucto Bay, in lat. 45° 19.5′ N. and long. 60° 55′ W.

CAPE CARTHAGE, a headland on the northeast coast of Tunis, jutting out into the Mediterranean. Traces of the ancient city of Carthage are found on it to the north of the Tunis lagoon.

CAPE CATOCHE, kä-tō'chā, a headland at the northeastern extremity of the peninsula of Yucatan, Central America, in lat. 21° 34′ N.

and long. 86° 57′ W. It is the northeast extremity of the Mexican state of Yucatan. It was here that the Spaniards first landed on the Mexican coast in 1517.

CAPE CHARLES, a cape at the northern entrance of Chesapeake Bay, forming the southern extremity of Northampton County, Va., in lat. 37° 7′ N. and long. 75° 53′ W. Northeast of it, on Smith's Island, is a first-order lighthouse with a revolving white light, signaling 45″ every minute and is 180 feet above mean high water.

CAPE CITY. See Cape May, N. J.

CAPE CLEAR, a headland forming the southernmost extremity of Ireland, in lat. 51° 26′ N. and long. 9° 29′ W. It is on an island of 1,506 acres, with a lighthouse on an abrupt cliff 455 feet high. Fastnet Rock, with a light 148 feet above high water, is distant three and one-half miles to the southwest. These are generally the first points of land seen by transatlantic voyagers eastward bound.

CAPE COAST CASTLE, a town and fort of western Africa on the Gulf of Guinea, in the British colony of the Gold Coast, in lat. 5° 5′ N. and long. 1° 13′ W. The place lies in a chasm, and is defended by the great castle near the water's edge, and by three small forts on the hills behind, one of which serves as a lighthouse and signal station. With the exception of a few houses for Europeans, the town consists of straggling lines of mud huts, with clusters of palm-trees and an occasional tamarind attached. It is a principal mart for native trade. It is connected by telegraph with Accra (the capital) and by road with Prahsue. The climate is unhealthy; mean temperature, 78°. The principal exports are gold-dust, ivory and palm-oil. Cape Coast Castle was ceded by the Dutch to the English in 1665, and from 1672 was possessed by several British African companies till 1843, when it was taken over by the British government. Pop., mainly Fantis (1911) 11,364.

CAPE COD, a cape and peninsula on the coast of Massachusetts, on the south side of Massachusetts Bay, forming the county of Barnstable; lat. of the cape, 42° 3′ N., long. 70° 15′ W. The peninsula is 65 miles in length and from 1 to 20 in breadth, and is in the form of a man's arm, bent inward both at the elbow and the wrist. Though mostly sandy and barren, it is nevertheless populous; and the inhabitants derive their subsistence chiefly from the sea. The best harbor on the peninsula is at Provincetown. There is a lighthouse known as the Highland Light, on the northeast shore, and one at Race Point almost directly west of the former. The navigation around the cape is peculiarly baffling and hazardous, and the saving to commerce and human life resulting from the short-cut waterway will undoubtedly be very great. A proposition to cut a canal from Buzzard's Bay to Barnstable Bay dates from the early part of the 17th century, but nothing was actually done until 1878, when a charter was granted by the legislature of Massachusetts, a company was formed and work begun. A new charter was granted in 1906, the canal was begun in 1909 and completed in 1914. The Old Colony division of the New York, New Haven & Hartford Railroad extends through the peninsula. The cape was discovered 15 May 1602 by Bartholomew Gosnold, who gave it its name from having taken a great quantity of codfish near it. In 1620 the Pilgrims of the *Mayflower* made a temporary landing at the site now occupied by Provincetown.

CAPE COLONNA. See Sunium.

CAPE COMORIN, kŏm′ō′rĭn, the most southern extremity of the peninsula of Deccan, British India, in lat. 8° 5′ N. and long. 77° 37′ E., forming a circular, low, sandy point, which is not discernible above the distance of 12 to 16 miles from the deck of a large ship. Eighteen miles north from the cape is a bold summit called Comorin Peak, the southern termination of the western Ghauts, which has, from a distance, been often taken for the cape itself. Within a short distance of the cape lies a rocky islet, high above water; and about three miles from this islet are a fort and a village, a few fishermen's houses, a church and some ancient temples, being the remains of the once famous town of Cape Comorin.

CAPE DIAMOND, Canada, the extremity of an abrupt promontory in the province of Quebec at the junction of the Saint Charles and Saint Lawrence rivers. On the promontory stands the citadel of Quebec, and on the west and nearly on a level with the ramparts lie the Plains of Abraham. It rises precipitously over 300 feet from the river level. Here was gained in 1755 the memorable victory by the English under Wolfe, over the French under Montcalm.

CAPE DISAPPOINTMENT, or CAPE HANCOCK, Wash., a cape at the north side of the mouth of the Columbia River, forming the southwest point of the State of Washington, in lat. 46° 16′ N. and long. 124° 3′ W. There is a lighthouse at this point with a flashing light 233 feet above sea-level.

CAPE DUCATO, doo-kä′tō, the southern extremity of Santa Maura, one of the Ionian islands. It is identical with the ancient promontory of Leucadia, commonly called the Lover's Leap, or Sappho's Leap. The famous Greek poetess, according to an ancient tradition, threw herself from the top of this promontory. It lies in lat. 38° 34′ N. and long. 20° 32′ E. The strong currents which sweep around the cape and the frequent fierce gales render it a dread to mariners.

CAPE ELIZABETH, Me., a headland projecting into Casco Bay, between Portland harbor and the Atlantic Ocean, in lat. 43° 33′ N. and long. 70° 11′ W. The coast is rocky, made up of ledges of talcose slate, traversed by dikes of trap. There are two lighthouses on the outer point, which stand 300 yards apart, the lights being 140 feet above the sea.

CAPE DE ESPICHEL (probably the ancient *Barbarium Promontorium*), a cape on the western coast of Portugal, 121 miles southwest of Lisbon. It rises abruptly from the sea, and is crowned by a small chapel and a lighthouse.

CAPE FAREWELL, the southern extremity of Greenland, at the eastern entrance to Davis Strait. A strong current sets around this cape, and continues north along the eastern coast of the strait. On account of the ice and the current the cape is seldom visited.

CAPE FARO, fä'rō, the northeast extremity of the island of Sicily, known to the ancients as *Pelorus*. It is at the narrowest part of the strait of Messina, opposite the rock of Scylla on the coast of Italy.

CAPE FEAR, the south point of Smith's Island, near the mouth of Cape Fear River, N. C., in lat. 33° 35′ N. and long. 77° 57′ W. About one mile from the shore stands Bald Head lighthouse. Navigation of the surrounding waters is attended by many dangers.

CAPE FEAR RIVER, a river of North Carolina; navigable for steamboats for 150 miles from its mouth to Fayetteville. Its length, including one of the head branches, is about 300 miles. Formed by the junction of the Deep South and Cape Fear rivers, its course is generally southeast till it reaches the Atlantic Ocean. This is the largest and most important river which lies wholly within the State. Rice growing is an important industry along its lower region.

CAPE FINISTERRE, fĭn-ĭs-tãr′, (Lat. *finis terræ,* land's end), the westernmost point of Spain, in the province of Corunna, extending southwest into the Atlantic, in lat. 42° 54′ N. and long. 9° 21′ W. Several naval battles were fought off this cape, of which the most important were the victories of the English over the French, 3 May 1747 and 22 July 1805.

CAPE FLATTERY, the most westerly point of the State of Washington and of the United States, excluding Alaska, at the entrance to the Strait of Juan de Fuca, in lat. 48° 23′ N. and long. 124° 44′ W. On the island of Tatoosh, opposite the cape, there is a lighthouse 155 feet above sea-level.

CAPE FLORIDA, the southern extremity of Biscayne Key off the southeast coast of Florida, in Dade County, at the north entrance to Biscayne Bay, in lat. 25° 39′ N. and long. 80° 9′ W. There is a lighthouse on the shoals opposite this point. It has a fixed red beacon light.

CAPE FOULWEATHER, a cape projecting into the Pacific Ocean from the coast of Oregon, in lat. 44° 50′ N. and long. 124° 5′ W.

CAPE FOX, or **LALANDE'S DOG,** a peculiar canine animal (*Otocyon lalandii*), differing from other dogs principally in the possession of an additional molar in each jaw. Other characters in the structure of the jaw and dentition suggest that *Otocyon* is a persistent creodont-like form which has developed from a primitive arctoid stock in a direction curiously parallel to that of the true dogs. No other mammal outside the marsupial order ever has four molar teeth in both jaws, and this may indicate a still more remote marsupial ancestry. This wild dog is generally found in open country, dwelling among small bushes in pairs, exceedingly shy, and not gathering into packs. It is rather smaller than a fox and resembles a fennec in having enormous ears and a thick bushy tail. In general color it is brownish or iron gray, mottled with yellow and with the limbs nearly black.

CAPE FRIO, frē′ō (Port. *Cabo Frio,* «cold cape»), a promontory on the coast of Brazil, in the state of Rio de Janeiro. It forms the terminus of a range of mountains running parallel to the coast, and consists of a huge oval mass of granite. There is a lighthouse at this point.

CAPE FROWARD, the southern extremity of the continent of South America, lying northwest of Cape Horn in lat. 53° 53′ S. and long. 71° 18′ W. It is a bold promontory of dark slaty rock.

CAPE GASPÉ. See GASPÉ.

CAPE DE GATA, gä′tạ, a promontory of Spain, on the coast of Granada, 150 miles east of Gibraltar, 24 miles in circuit and 13 miles broad. It was formerly a resort of Moorish pirates.

CAPE GIRARDEAU, jē-rär-dō′, Mo., a city of Cape Girardeau County, on the Mississippi River and on the Cape Girardeau and Northern Railroad and the Frisco Lines, 150 miles southeast of Saint Louis. It is a well-cultivated region and has a large commerce, by river and railroad, in lumber, flour, limestone and mineral paints. There are also manufactories of Portland cement, shoes, bentwood, bricks, tobacco, washtubs, veneer, threshing machines, beer, etc. The United States census of manufactures for 1914 recorded 42 industrial establishments of factory grade, employing 1,397 persons, of whom 1,259 were wage earners, receiving annually $607,000 in wages. The capital invested aggregated $3,074,000, and the year's production was valued at $3,888,000; of this $1,532,000 was the value added by manufacture. The notable institutions include Saint Vincent's College and Academy, the Southeast Missouri State Normal School, Saint Francis Hospital and the Loretto Convent. The government is administered by a mayor, elected biennially, and a city council. Pop. 10,033.

CAPE OF GOOD HOPE, a province in the Union of South Africa, formerly Cape Colony, is situated at the southern extremity of Africa, washed on the west, south and east by the ocean, and having on the north and northeast the German territory of Great Namaqualand, the British territory of Bechuanaland, Orange Free State province, Basutoland and the province of Natal. A considerable portion of the boundary on the north is formed by the Orange River. The colony extends about 450 miles from north to south, and 600 from east to west; the coast line is about 1,300 miles. The area is 276,000 square miles. The principal indentations of the coast are Saint Helena, Saldanha, Table, False, Walker, Mossel, Plettenberg, Saint Francis and Algoa bays.

In the interior almost every variety of soil and surface is found, but a great part of the colony is arid and uninviting in appearance. Several ranges of mountains, running nearly parallel to the southern coast, divide the country into successive terraces, rising as they recede into the interior, between which lie belts of fertile land, or vast treeless and barren-looking plains. One of these, called the Great Karoo, is 300 miles long and 100 broad, and presents a desolate appearance, having a dry and often baked soil, with small shrubby plants scattered over it. Yet these plains make valuable sheep-walks, the flocks thriving exceedingly well upon the scanty vegetation; and the soil, where water can be obtained by collecting the rain, is generally very fertile. Large reservoirs have been constructed in many places, and permanent homesteads established where formerly flocks could only be maintained for a month or six weeks at a time. The principal and farthest inland mountain terrace averages 6,000 or 7,000 feet in height, and, commencing in Namaqualand, runs eastward under the names of Roggeveld, Nieuwveld, Sneeuwbergen, Stormbergen, etc., to the northeast frontier. The culminating point is the Compass Berg, over 8,000 feet high. The Table Mountain at Cape Town is a stupendous mass of naked rock, rising almost perpendicularly, about 3,585 feet in height. The colony is deficient in rivers, though in this respect the eastern half is more favored than the western. The Orange River is the largest in this part of Africa, but is of little or no use for navigation. Others are the Elephants or Olifants River, flowing into the Atlantic; the Gauritz, Gamtoos, Great Fish, Sunday and Great Kei, emptying themselves into the sea on the south and southeast.

The most valuable mineral product is diamonds; copper ore is largely exported, coal is mined, and iron ore, gold, amethysts, agates, etc., are found. The bulk of the diamonds that come into the markets of the world in the rough state are now obtained from Cape Colony. The great mining centre is Kimberley, in the far north of the colony, about 10 miles from the Vaal River, and near the frontier of the Orange River Colony. So far as is known, the first of the South African diamonds was casually picked up in 1867, and soon after several others were found, including a fine, large stone known as the "Star of South Africa." By the early part of 1870 so many diamonds had been found that a rush of people to the diamond district began to take place, and the banks of the Vaal were soon covered with thousands of diggers. At first the precious stones were found on or near the surface, but subsequently it was discovered that they were to be found deeper down, and latterly they have been obtained many hundreds of feet below the surface, great open excavations having been made at the localities where they are plentiful. The richest mine has been the Kimberley mine, situated in the centre of the town of the same name, which sprang up around it. For the first hundred feet in depth the diamonds were found embedded in a soft, friable, yellowish earth; below that the soil changed to a slaty-blue color, and was of a firmer consistency, and the diggers then thought that the bottom of the mine had been reached. It was soon discovered, however, that the blue ground yielded as many diamonds as the yellow, if not more, and this productivity has still continued. Another famous mine is the De Beers mine. Both these mines have yielded a remarkable number of large stones, but a great many of the diamonds have been "off-color," that is, yellow, spotted or otherwise defective in water or lustre. One of the finest yet found in South Africa is the "Porter Rhodes," a beautiful stone weighing 150 carats, and valued at $300,000. One much larger, a yellow stone, weighing 302 carats, was found in 1884, and a still larger, weighing 428½ carats, was found in the De Beers mine in 1888. The largest in the world, weighing 971 carats, but with a large flaw, was found in the Orange Free State in 1893. Although mining operations have been carried on at great expense, owing to the depths to which the workings have been sunk (some 600 feet or more), the profits of the companies which latterly have owned the mines have been enormous. The rough work has been done almost entirely by the native Africans, of whom 10,000 or 11,000 have been in employment in the mines at one time. Very stringent regulations have had to be enforced to prevent theft of the precious stones, and also illicit dealing in stones unlawfully acquired.

The climate is very healthy and generally pleasant, though in summer the heat is great in some parts. The mean temperature for the year at Cape Town is about 62°. The climate of the dry and elevated inland districts is considered remarkably suitable for persons of consumptive tendency, and many have been attracted to the colony on this account.

Except along the coast line, especially the southeast coast district, where there are extensive forests, timber is scarce. There are upward of a hundred different kinds of woods, however; many of them extensively employed for such purposes as house-building, wagon-making and furniture- and cabinet-work. With irrigation, trees can be grown anywhere. The aloe and the myrtle attain a great size.

The quadrupeds of the province comprise the African elephant, still found in the forests of the south coast region; the buffalo, equally restricted in locality; the leopard, jackal, hyena, numerous antelopes, baboon, aardvark, etc. Lions, at one time numerous, are not now to be met with in the colony, nor is the giraffe. The birds include vultures, eagles and other *Raptores* (the most remarkable of which is the serpent-eater), pelicans, flamingoes, and most important of all, the ostrich, now bred as a domestic animal for the sake of its feathers, those plucked from an adult bird in a season being sometimes worth from $50 to $90. Other native animals are large snakes, the venomous cobra di capello and scorpion. Along the coast whales and seals abound, and salt- and fresh-water fish are plentiful.

The province is better adapted for pasturage than for agriculture, but wheat, maize and other cereals can be grown almost everywhere, the only drawback to their cultivation being the want of moisture in certain localities and in certain seasons. In some years a surplus of grain is left for exportation; in others grain has to be imported. All kinds of European vegetables and pot-herbs, and all the fruits of temperate climates, such as apples, pears, plums, peaches, melons, apricots, walnuts, almonds, oranges, limes, etc., thrive excellently, and fruits, dried and preserved, are exported. The vine is cultivated and some excellent wines (notably those of Constantia) are made. The colony is said to be particularly well suited for grape-culture, and the vines produce heavier crops than are known almost anywhere else. Viticulture, it is believed, is yet only in its infancy, though there are 67,000,000 vine-stocks. The colonial government had up to the end of 1911 alienated 140,000,000 acres.

Sheep-raising is the most important industry, and wool the chief export (although surpassed in value by diamonds). The amount of this article exported to the United Kingdom in 1913 was 92,813,330 pounds. Most attention is now devoted to the breeding of pure merinoes, the consequence being a great improvement in the wool. Goats are also bred, both the native and the Angora, and the export of goats' wool or hair to Great Britain was valued at $4,600,000 (1913). Cattle-breeding is carried on to some extent, especially along the coasts and in the eastern and northern districts.

There are no manufactures of any importance, and consequently the imports consist largely of manufactured goods, chiefly from Great Britain. The exports to the United Kingdom (1913) totaled $47,000,0000, and the imports (British and foreign) to nearly $60,000,000. The export of diamonds in the same year was over $60,000,000. This industry suffered great disorganization during the European War. The other exports of importance besides wool, are ostrich feathers, copper ore, skins and hides. There are 3,813 miles of railway in operation. Lighthouses have been built round the coast and harbor works constructed.

The coinage is that of Great Britain, as are also the weights and measures, except that for land, the *morgen*=2.116 acres is employed.

On 31 May 1910 the colony, under the name of the province of the Cape of Good Hope, was merged in the Union of South Africa (q.v.).

The European population consists in part of English, Scottish and Irish settlers and their descendants, but the majority is of Dutch origin (see Boers), with a considerable number of German origin. The colored people are chiefly Hottentots, Kaffirs, Bechuanas, Basutos, Griquas, Malays and a mixed race, the offspring of black women and white fathers. The laborers are chiefly Hottentots and Kaffirs. The prejudices and ill feeling once subsisting between the different nationalities of which the population is made up are now fast disappearing. Education is advancing, though it is not compulsory. The returns show a steady increase in the numbers of children of all classes receiving instruction. For the higher education there are seven colleges, besides a university (at Cape Town) incorporated in 1873. The colleges have each a staff of instructors in classics, mathematics, science, etc., but the university is merely an examining and degree-conferring institution. The religious bodies in the colony with the greatest number of adherents are the Dutch Reformed Church, the Church of England, the Methodist Independents and Presbyterians, in the order here given. There is no Established Church.

The chief towns of the colony ranking after Cape Town are Port Elizabeth and Kimberley (qq.v.).

The Cape of Good Hope was discovered by Bartholomew Diaz in 1486, and rounded by Vasco da Gama in 1497, but was first colonized by the Dutch under Van Riebeek in 1652. Reducing the Hottentot inhabitants to slavery, or driving them beyond the mountains, they extended the Cape settlement over a pretty large area. But the colony was under the rule of the Dutch East India Company, and owing to their restrictive regulations, made very slow progress. It was captured by the British in 1795, restored at the Peace of Amiens (1802), and again taken in 1806, Sir David Baird being sent at the head of an expedition to take possession of it, and so prevent it from falling into the hands of the French. From this time it has remained in the possession of the British, to whom it was formally assigned in 1815, along with Dutch Guiana, Holland receiving in return £6,000,000. It now began to advance in prosperity, but the progress of the colony was greatly retarded by the Kaffir wars of 1834, 1846 and 1851–53. Subsequently the area of the colony was greatly enlarged by the successive annexations. The most important of these annexations were: British Kaffraria (1866); Griqualand West (1876); Kaffraria proper, or the Transkeian districts (Transkei proper, Griqualand East and Tembuland), including nearly the whole of the region between the Kei and the Natal border (1875–80); Pondoland (1894)), and part of Bechuanaland (1915). Pop. (1911) 2,564,965, of which 582,377 were Europeans. See South Africa, Union of.

CAPE DE GRISNEZ, grē-nā', a headland of France in the department of Pas-de-Calais, the nearest point of the French coast to Great Britain. It has a revolving light 195 feet high.

CAPE GUARDAFUI, gwär-dä-foo-ē', or **GARDAFUI**, a cape on the east coast of Africa in Italian Somaliland, situated in lat. 11° 50' N. and long. 51° 16' E. at the entrance to the Gulf of Aden.

CAPE DE LA HAGUE, häg (written also, but less correctly, La Hogue), a headland of Normandy, France, opposite the island of Alderney, 20 miles northwest of Cherbourg, and forming the northwestern extremity of the peninsula of Cotentin, in the English Channel. It is often confounded with Fort La Hogue or La Hougue, on the opposite side of Cotentin. Near this latter promontory the united English and Dutch fleets defeated the French, 19–24 May 1692.

CAPE HAITIEN, ä-ē-tē'äṅ, or **CAPE HAYTIEN**, Haiti, a town on the north coast of the island. It was formerly known as Cap Français, Le Cap or Guarico, the latter being the native name. It has an excellent harbor. The town is well laid out and has the appearance of the older European towns. Before the earthquake in 1842 it was known as «Little Paris,» but as most of the white settlers did not rebuild, the town has not recovered since. During the French occupation, Cape Haitien was the capital of the island. It was bombarded by the English in 1865. The commerce is very important, and the chief exports are coffee, logwood, cacao, hides and honey. In 1913 the exports from Cape Haitien amounted to $1,254,407; in 1915 they amounted to only $352,418, the shrinkage being due to the hampering of commercial activity by the war in Europe; the imports in the same years amounted to $1,194,453 and $560,881 respectively. Pop. about 30,000.

CAPE HATTERAS, the easternmost point of North Carolina, a sandy insular spit, or narrow beach, separated from the mainland by the broad bay called Pamlico Sound. South of the capes of the Delaware, no land stretches so far out into the Atlantic as Cape Hatteras. The Gulf Stream, in its eastern and western vibrations, often flows within 20 miles of the cape, crowding toward the shore coasting vessels bound south. The difference of temperature between the hot airs of the Gulf and the breezes along shore and from the land engender frequent commotions in the atmosphere at this place; and no point on the coast is more noted for its frequent and dangerous storms. A lighthouse is kept a little over a mile north of the outermost point. Also about three-quarters of a mile south a fixed white beacon light is placed about 35 feet above sea-level.

CAPE HENLOPEN, a cape on the eastern coast of Delaware at the south side of the entrance of Delaware Bay, in lat. 38° 47′ N., and long. 75° 5′ W. It is 13 miles south of Cape May, on the opposing New Jersey shore. The Cape Henlopen light, 126 feet above sea-level, is a fixed white light.

CAPE HENRY, a cape on the coast of Virginia at the southern entrance of Chesapeake Bay in lat. 36° 56′ N. and long. 76° 1′ W., opposite Cape Charles. It has a fixed white light with fixed red sector between south-southeast and southwest by west 157 feet above the level of the sea. Cape Henry has also a life-saving station.

CAPE HORN, the southern extremity of an island of the same name, forming the most southerly point of South America. It is a precipitous headland, 500 to 600 feet high, and running far into the sea. Sailing vessels often encounter dangerous tempests in passing round the Horn; steamers generally pass through the Straits of Magellan. The cape was first doubled in 1616 by the navigator Schouten, a native of Hoorn, Holland, whence its name. It is situated in lat. 55° 59′ S. and long. 67° 16′ W. The climate is perennially Antarctic.

CAPE HUNTING-DOG, a wild dog of Africa (*Lycaon pictus*), which is placed in a separate genus because it differs from all other dogs in having only four toes on each limb, in lacking one pair of molars in the upper jaw and in certain other features. It resembles a hyæna in form, and is yellowish-gray, with irregular, black markings. It hunts in packs and is one of the enemies most dreaded by all the African antelopes. Since the decrease of this, its natural game, it has played havoc with domestic cattle and sheep, and is killed off by the settlers wherever found. It is fast becoming rare. Consult Ingersoll, 'The Mammals' (New York 1906).

CAPE ISLAND CITY. See CAPE MAY, N. J.

CAPE JUBY, Africa, a barren, sandy projection into the Atlantic Ocean, 67 miles due east from the island of Fuerteventura of the Canary group. It is part of the section of the western Sahara which extends along the Atlantic Coast between the Mogador district and Rio de Oro. Water is very scarce on the cape, but is obtained in the ravines by sinking wells. The interior supports great numbers of sheep and produces large crops of wheat, barley and corn. The ocean fisheries at this point are abundant, and most of the catch is marketed in the Canary Islands. There is a monthly steamship service between Cape Juby and Santa Cruz de Teneriffe. A wireless station was erected on the cape in 1916, thus establishing communication with the large station on Teneriffe, and through this, with the Spanish mainland.

CAPE LINGUETTA, lĭn-gwĕt'tạ, a headland of Janina, Greece, 2,290 feet high. It forms the termination of the Chimara, or Acroceraunian Mountains and bounds the east entrance into the Adriatic at the Strait of Otranto.

CAPE LOOKOUT, a cape situated on an island off the southeast coast of North Carolina, in lat. 34° 37′ N. and long. 76° 31′ W. There is a lighthouse with fixed white light at a height of 156 feet above the sea. It is 63 miles southwest of Cape Hatteras and 12 miles southeast of Beaufort.

CAPE LOPATKA, the southern extremity of Kamchatka. At the northern part of the headland is a mountain, bearing the same name, whence the land gradually slopes and narrows until it terminates in a low and barren tongue.

CAPE LOPEZ, lō'pāth, the southern extremity of the Bight of Biafra, on the west coast of Africa. It is situated in lat. 0° 36′ S. and long. 8° 44′ E.

CAPE MATAPAN, mä-tạ-pän', a promontory of Greece, forming the southern extremity of the Peloponnesus, in lat. 36° 23′ N. and long. 22° 29′ E. The name *Tænarum*, or *Promontorium Tænarium*, was applied by the Greeks to the headland, and to the small peninsula north of it, connected with the great Taygetic Peninsula by a narrow isthmus. It was sacred to Neptune, whose temple stood nearby.

CAPE MAY, N. J., a city and watering place in the southern part of Cape May County, having good railroad and water communication. It has a fine beach and is very popular as a seaside resort, providing accommodations in hotels and boarding-houses for guests 10 times exceeding in number the permanent inhabitants. The industries include fishing, canning, oyster raising, gold beating and sand washing. Its harbor has an area of 500 acres and an average depth of 35 feet. It is the only port of refuge south of Sandy Hook on the New Jersey coast and is the scene of many important yachting events. The government is administered by a mayor, elected for three years, and a city council. The place is sometimes called Cape City or Cape Island City. Pop. 3,000.

CAPE MAY COURT HOUSE, N. J. town and county-seat of Cape May County, 70 miles south of Philadelphia, and 11 miles north of Cape City, or Cape May, on the Atlantic City, and Pennsylvania railroads. Glass blowing, fishing and agriculture are among its chief industries. It contains two churches and a penitentiary. Pop. 1,300.

CAPE MAY POINT, the southern extremity of New Jersey, at the northern entrance to Delaware Bay, situated in Cape May County, in lat. 38° 56′ N. and long. 74° 57′ W. It has a revolving light about 160 feet above sea-level.

CAPE MENDOCINO, mĕn-dō-sē'no, the westernmost point of the coast of California, projecting into the Pacific Ocean in lat. 40° 26′ N. and long. 124° 25′ W. It has a very high lighthouse, 422 feet above sea-level, with a flashing light.

CAPE NEDDOCK, Me., a promontory 35 miles southwest of Portland, with a lighthouse on Goat Island near it, containing a fixed light, 33 feet above the sea.

CAPE NOME, nōm, a cape on the south coast of the peninsular projection of Alaska which separates Kotzebue Sound on the north from Bering Sea on the south. In the vicinity of the cape is a remarkably rich gold mining region. The Nome district as settled centres about the lower course of the Snake River, an exceedingly tortuous stream in its tundra course, which emerges from a badly degraded line of limestone, slaty and schistose mountain spurs, generally not over 700 to 1,200 feet elevation, but backed by loftier granitic heights, and discharges into the sea at a position 13 miles west of Cape Nome proper.

The first discovery of gold was made in September 1898, but it was not until July 1899 that the beach gold was discovered. In the middle of October following, Nome City had 5,000 inhabitants all living in tents on the hitherto barren shore. For a time it appeared as if this region would rival in richness the famous Klondike district, but this anticipation has not been realized.

CAPE NORTH, the northeast point of Cape Breton, east of Saint Lawrence Bay, projecting into the Gulf of Saint Lawrence.

CAPE NORTH, northernmost promontory of Europe. See North Cape.

CAPE NUN, noon, a headland on the west coast of Morocco, extending into the sea at the southwestern extremity of the Atlas range, in lat. 28° 45′ N. and long. 11° 5′ W.

CAPE ORTEGAL, ôr-tā-gäl′, a rugged promontory forming the northern extremity of Spain, extending into the Bay of Biscay, in lat. 43° 45′ N. and long 7° 56′ W. The coast at this point is barren and rugged.

CAPE PALMAS, a cape on the western coast of Africa, situated in the southern part of Liberia, in lat. 4° 22′ N. and long. 7° 44′ W. In 1834 the Maryland colony of free colored emigrants settled on this point.

CAPE PETREL, or **CAPE PIGEON**, a large petrel (*Daption capensis*), about the size of a pigeon, exceedingly numerous about the Cape of Good Hope, and widely distributed throughout the Southern Ocean. Consult Milne-Edwards, A., in 'Annales des sciences naturelles' for 1882.

CAPE PILLAR, a high mass of rocks terminating in two tower-shaped cliffs on the northwest coast of Desolation Island, at the southwest entrance from the Pacific Ocean into the Straits of Magellan.

CAPE POGE, a cape on the coast of Massachusetts, in lat. 41° 25′ N. and long. 70° 26′ W. It is the extreme northeast point of the Martha's Vineyard Island group. It has a lighthouse with a flashing white and red, every third flash red, light, with five seconds interval.

CAPE PRINCE OF WALES, a promontory on Bering Sea, the most northwest point of North America. It terminates in a peaked mountain, presenting a bold face to the sea, and is a dangerous point on account of a shoal which stretches to the northeast. It lies opposite East Cape on the coast of Siberia. Bering Strait between the two is the narrowest water between America and Asia.

CAPE RACE, a promontory at the southeastern extremity of Newfoundland, in lat. 46° 39′ N. and 53° 4′ W. The fogs of this part of the coast make navigation hazardous. The British government maintains a light here.

CAPE RIVER, or **RIO DE SEGOVIA**, known also as Coco or Wanks, a river of Nicaragua, Central America, which after a generally northeast course of nearly 300 miles enters the Caribbean Sea at Cape Gracias á Dios. It is navigable for a considerable distance from the sea, but the upper part of its course is obstructed by cataracts and shallows. It forms part of the boundary between Honduras and Nicaragua.

CAPE ROMAIN, a low and barren point of land, with a lighthouse, 37 miles northeast of Charleston, S. C.

CAPE SABLE, the name of two capes in North America: (1) The southernmost point of the mainland of the United States at the extremity of Florida, in lat. 25° 8′ N. and long. 81° 9′ W. (2) A point at the southwest extremity of Nova Scotia, in lat. 43° 23′ N., and long. 65° 37′ W.

CAPE SAINT ROQUE, rō′kā, **SAN ROQUE**, or **SÃO ROQUE**, a cape on the east coast of Brazil, in lat. 5° 29′ S. and long. 35° 14′ W.

CAPE SAINT VINCENT, a headland at the southwestern extremity of Portugal, in lat. 37° 3′ N. and long. 8° 58′ W. Off this cape, 14 Feb. 1797, an English naval force, consisting of 15 ships of the line, under Admiral Jervis, defeated a superior Spanish fleet. This point was known to the ancients as *Promontorium Sacrum*.

CAPE SAN ANTONIO, sān ān-tō′nē-ō, the name of two capes: (1) A high, barren and precipitous headland, on the coast of Valencia, Spain, opposite the island of Iviza. On its summit are a convent, a watch tower and several windmills. (2) A lofty and nearly perpendicular promonotory, at the mouth of the Rio de la Plata, in the province of Buenos Aires, Argentina.

CAPE SAN BLAS, sān blā, a low point of land, about two miles long, on the south coast of western Florida, in Calhoun County, 123 miles east-southeast of Pensacola. It lies between San Blas Bay and Saint Joseph's Bay. It has a revolving light 98 feet above sea-level.

CAPE SAN LUCAS, loo′kās, the southern extremity of the peninsula of Lower California, Mexico, in lat. 22° 44′ N. and long. 109° 54′ W.

CAPE SPARTIVENTO, the ancient *Herculis Promontorium*, a promontory of southeastern Italy, forming the southeastern extremity of Calabria, in lat. 37° 57′ N. and long. 16° 5′ E.

CAPE OF STORMS. See Cape of Good Hope.

CAPE TINDARO, tĭn-dä′rō, a headland of Sicily, near Falcone, extending into the Gulf of Patti. The remains of the ancient Tyndaris are in its neighborhood.

CAPE TOWN, Africa, capital of the province of the Cape of Good Hope in the Union of South Africa and the seat of the legislature under the Union, is situated in the midst of striking scenery, rather more than 30 miles from the Cape of Good Hope, at the head of

Table Bay, which opens into the Atlantic on the northwest, and at the foot of Table Mountain. It was founded by Johann van Riebeck in 1652, on behalf of the Dutch East India Company. It is regularly laid out and has some good streets, with well-built business premises and other buildings, and is furnished with most of the institutions and conveniences of a European town (including tramways). The electric lighting and water supply are in the hands of the corporation. The finest edifice is that which accommodates the legislature, a handsome structure of modern erection; another good edifice is that containing the public library (40,000 volumes) and museum built in the Roman-Corinthian style. The Standard Bank of South Africa occupies handsome premises. Other buildings are the government house, the courts and government offices, the town house, the gallery of fine arts, the railway station, the post-office, the exchange, etc. The best ecclesiastical building is the Roman Catholic cathedral; there is also an English Episcopal cathedral and Dutch, Presbyterian, Lutheran, Independent and Methodist churches. There is a well-equipped college, the South African College, which trains students for the degrees of the Cape University, which is merely an examining body. There are beautiful botanic or government gardens in the town, occupying 14 acres and forming a fine promenade. The Cape Observatory is a celebrated institution supported by Imperial funds. The port has been provided with an extensive breakwater inside of which ships can safely ride at anchor protected from the northwest gales; and there are two docks 16 acres in area, an outer harbor of 62 acres, a large graving dock, etc. The net tonnage cleared in 1912 was 3,979,527 tons. The population is very mixed, a large number consisting of colored people of negro or other African descent. In 1913 a number of contiguous municipalities were incorporated within the boundaries of Cape Town, the population of which was then composed of 81,600 Europeans and 73,623 colored persons and the valuation nearly $110,000,000.

CAPE TRAFALGAR, trăf-ăl-gär, or tră-făl′gar, a headland on the coast of Cadiz, Spain. It is memorable for the naval battle fought near it, 21 Oct. 1805, between the English under Nelson and the combined fleets of France and Spain. The English gained a complete victory, though with the loss of their commander. It was known to the Romans as *Promontorium Junonis.*

CAPE VERDE, the most westerly headland of Africa, in Senegal, jutting out into the Atlantic Ocean, between the rivers Gambia and Senegal, in lat. 14° 43′ N. and long. 17° 34′ W. It was discovered by the Portuguese navigator, Fernandez, in 1445, and is said to have derived its name from a group of gigantic baobab trees adorning its summit and forming a green patch on the white coast.

CAPE VERDE ISLANDS, a group of islands west of Africa, in the Atlantic Ocean, so called from Cape Verde, opposite to which they are situated, 320 miles west of Cape Verde, and between lat. 15° and 18° N. and between long. 22° and 25° W. They belong to Portugal. As to their number, some reckon 10, others 14 or more, by giving the name of islands to masses which are only rocks. The 10 principal islands are São Thiago, Fogo, Brava, Maio, Boavista, São Nicolão, Santo Antão, São Vicente, Santa Luzia and Sal. The total area of the group is 1,516 square miles. They are, in general, mountainous. The island of Fogo, one of the group, consists of one single mountain, a volcano, sometimes active, about 10,000 feet above the level of the sea. Some of the islands are very bare; in others the lower hills are covered with a beautiful verdure, as well as the valleys between; but there is little water, except what is found in ponds and wells. Long droughts have occurred, sometimes causing great loss of life. The climate is hot and unhealthy in most of the islands. The soil is, for the most part, not very fertile; nevertheless some parts produce sugar, coffee, rice, tobacco, maize, etc., with bananas, lemons, oranges, citrons, grapes and other fruits. European domestic animals abound and thrive well. Marine turtles are plentiful. The ports of the archipelago were visited in 1913 by 1,696 merchant vessels of 6,136,784 tons, besides coasting trade. In 1914 the imports were valued at $2,306,610; the exports in the same year were valued at $332,739. The total population amounted to 143,929 in 1912, of whom 4,799 were white, the rest being chiefly negroes. The chief town is Praia on São Thiago (Santiago), and Porto Grande on São Vicente is a coaling station for steamers. Salt is an export of importance. Coffee, hides and physic-nuts are also exported. There is a resident governor at Praia. Consult Ellis, ‘West African Islands’ (London 1885); Fea, ‘Delle Isole del Capo Verde’ (Rome 1899); Lima, «Rapport sur les iles du Cap Vert» (in ‘Recueil consulaire,’ Vol. CX, Brussels 1900).

CAPE WRATH, a pyramidal promontory of unrivaled wildness and grandeur, forming the northwest extremity of Scotland and running out into the Atlantic; in lat. 58° 38′ N. and long. 4° 58′ 5″ W. It presents deep fissures and tall pinnacles. From it a reef of rocks, perforated with arches and caverns, juts out into the sea. Off the cape is Stag Rock, a pillar 200 feet high. Cape Wrath is 525 feet high, and there is a lighthouse near it, 400 feet above the sea, visible 25 miles off.

CAPEFIGUE, käp-fēg, **Baptiste Honoré Raymond,** French historian and journalist: b. Marseilles 1802; d. Paris, 23 Dec. 1872. He entered the field of journalism and contributed to various publications under the signature «Un homme d'état.» He was appointed to a post in the Foreign Office, holding it until 1848. He thus had access to various documents unknown or closed to others. He was a prolific writer, producing about 100 volumes of history, many being biographies of famous women. They were hastily written, are uncritical and tinged with the Bourbon sympathies of the author. His most important contributions to historical science are the ‘History of Philip Augustus’ (4 vols., 1829); ‘History of the Restoration and of the Causes that Led to the Fall of the Elder Branch of the House of Bourbon’ (1831–33); ‘Histoire de la réforme, de la ligue, et du règne de Henri IV’ (8 vols., 1834–35).

CAPEL, Arthur, Lord, English soldier: b. about 1610; d. 9 March 1649. He was son of

Sir Henry Capel; was raised to the peerage as Lord Capel, of Hadham, by Charles I in 1641. He sat for Hertford in both the Short Parliament and the Long Parliament, and took sides with the popular party under Pym in demanding redress of various grievances. He strongly opposed revolution, however, and during the revolutionary war he fought bravely as one of the royalist generals in the west in the engagements at Bristol, Exeter and Taunton. Having been at length forced to surrender at Colchester to General Fairfax, he was imprisoned and, after some vicissitudes, executed. His 'Daily Observations or Meditations' was published posthumously with a memoir.

CAPEL, Arthur, Viscount Malden and Earl of Essex, English statesman, son of the preceding: b. January 1631; d. July 1683. He fought for the King in the civil war and on the accession of Charles II was appointed lord-lieutenant of Hertfordshire. In 1661 he was created Viscount Malden and Earl of Essex and appointed Ambassador to Denmark in 1670. He served as lord-lieutenant of Ireland, 1672–77, and was for a few months in 1679 head of the treasury commission. He opposed the court party and supported the Exclusion Bill. Arrested for his connection with the Monmouth conspiracy (1682) he was sent to the Tower, and is supposed to have committed suicide there.

CAPEL, Thomas John, Monsignor, English Roman Catholic ecclesiastic: b. London, 28 Oct. 1836; d. Sacramento, Cal., 24 Oct. 1911. He was ordained to the priesthood in 1860. He conducted a mission for English-speaking Catholics at Pau 1868–73, and was given the title of Monsignor by Pope Pius IX. He afterward devoted himself to education, establishing a Roman Catholic public school at Kensington in 1873 and achieved celebrity as a preacher and proselytizer. He came to the United States in 1883, and after a lecture tour settled to private life in California. He is the author of 'The Holy Catholic Church'; 'Confession'; 'The Name Catholic'; 'The Pope the Head of the Church.' He is the original Monsignor Catesby in Disraeli's 'Lothair.'

CAPEL, or **CAPLE,** a term used by miners to indicate the wall of a lode, especially in a tin or copper mine. It is generally of quartz, black tourmalin and hornblende. The capels sometimes contain sufficient metallic particles to make it worth while to work them. In these cases they may be considered as forming part of the lode. The word «cab» is an equivalent used by Cornish miners. In the United States, «casing» is nearly synonymous.

CAPELINE, or **CAPELLINE,** a small piece of armor, consisting of a skull cap of iron, worn in the Middle Ages by light armed men such as archers.

CAPELL, Edward, English Shakespearean scholar: b. Throston, Suffolk, 1713; d. London, 24 Feb. 1781. He was educated at Cambridge; he was deputy inspector of plays after 1737 and devoted his life to the study of Shakespeare. He transcribed this author's plays 10 times. He collated the quartos and the first two folios with greater care than any previous editor. He published 'Prolusions or Select Pieces of Ancient Poetry' (1760); 'Mr. William Shakespeare, His Comedies, Histories, and Tragedies' (10 vols., 1768); 'Notes and Various Readings of Shakespeare' (1783); and 'The School of Shakespeare.'

CAPELLA, Martianus Mineus Felix, Latin writer probably of the 5th century: b. probably in Carthage, Africa. His extant work, 'Satiricon,' consists of nine books, the first two under the title, 'De Nuptiis Philologiæ et Mercurii,' being an introductory allegory, while the others treat of grammar, logic, metaphysics, geometry, arithmetic, astronomy and music. It is a sort of encyclopædia and was much esteemed in the Middle Ages. His statement of the heliocentric system of astronomy in the eighth book may possibly have given hints to Copernicus, who quotes him occasionally. The best edition is that of Eyssenhardt (Leipzig 1886). Consult Teuffel, 'Geschichte der römischen Litteratur' (6th ed., Leipzig 1911).

CAPELLA, a star situated in the constellation Auriga, on the «Charioteers» left shoulder. It is of remarkable brilliancy, only four stars exceeding it in that respect. Its color is nearly that of solar light. It is one of Secchi's solar stars, whose spectra closely resemble that of the sun, being ruled with dark lines due to metallic vapors. Its parallax, determined by Elkin, is 0".08, corresponding to a distance nearly 26,000,000 times the distance from the earth to the sun. Its light takes about 40 years to reach us. It is often called Capra. In mythology Capella was Amalthea's goat, which suckled Jupiter.

CAPELLINI, kä-pĕl-lē'nē, **Giovanni,** Italian geologist and palæontologist: b. Spain, 13 Aug. 1833. He studied at Pisa and traveled widely. In 1860 he became professor at Genoa, and later at Bologna. He has emphasized the importance of prehistoric discoveries which related archæology to palæontology and defended the Darwinian theory. He was influential in calling the International Congress of Anthropology and Prehistoric Archæology in 1865. He founded in Bologna a geological museum. His publications include 'Delfini fossili del Bolognese' (1864); 'Relazione d'un viaggio scientifico nell' America settentrionale' (1867); and 'Armi e utensili di pietra del Bolognese' (1870).

CAPELLO, kä-pĕl'lō, **Bianca,** Italian adventuress: b. Venice 1542; d. in the Castle Paggio di Capano, 11 Oct. 1587. In 1563 she eloped with a banker's clerk named Pietro Buonaventuri, who put himself under the protection of Francesco de Medici at Florence. The latter made Bianca his mistress and her husband his steward, but had him put to death in 1570, and after the death of his wife, Joanna of Austria, married Bianca in 1578. She and Francesco are supposed to have been poisoned by his brother and successor, Cardinal Fernando.

CAPEN, Elmer Hewitt, American clergyman educator: b. Stoughton, Mass., 5 April 1838; d. Medford, Mass., 22 March 1905. He was graduated at Tufts College in 1860, and was elected to the Massachusetts legislature while still an undergraudate, 1859. After studying at the Harvard Law School, he was admitted to the bar in 1863 and practised at

Stoughton for a short time; began the study of theology, was ordained pastor of the Independent Christian Church of Gloucester in 1865, held pastorates at Saint Paul, Minn., and Providence, R. I., 1865–75, when he was elected president of Tufts College, a position he held till his death. His administration was most successful in every way, and under him the institution grew to be one of the most progressive of American colleges. His collected addresses appeared, entitled ‹Occasional Addresses› (1902). Consult Tombo, A., ‹In Memoriam E. H. Capen› (New York 1905).

CAPEN, Nahum, American historical writer: b. Canton, Mass., 1 April 1804; d. 4 Jan. 1886. In 1825 he began business in Boston as a publisher, with the firm of Marsh, Capen and Lyon. He was among the first to agitate the matter of an international copyright, his memorial to Congress on the subject being one of the first presented to that body; a letter of his, printed by the Senate, led to the organization of the census bureau at Washington and as postmaster of Boston in 1857–61, he established the custom of collecting letters from street boxes. He contributed to the press many articles on history and political economy. He edited a translation of the ‹Works of Dr. Gall› (6 vols.); the ‹Annals of Phrenology› (2 vols.); ‹The Writings of Hon. Levi Woodbury, LL.D.› and ‹The Massachusetts State Records› from 1847 to 1851 (5 vols.). He published ‹The Republic of the United States› (1848); ‹Reminiscence of John G. Spurzheim and George Combe› and a ‹Review of the Science of Phrenology› (1881). He left an unfinished ‹History of Democracy› (Vol. I, 1874).

CAPENA PORTA. See CAMPUS SCELERATUS.

CAPER-BUSH, a shrub of the genus *Capparis* of the family *Capparidaceæ.* The genus includes about 150 species of trees and shrubs, distributed throughout the warmer regions of the earth. Capers are pickles made by preserving the flower buds of *C. spinosa,* a straggling, spiny shrub of the Mediterranean region.

CAPERCAILZIE, kăp-ėr-kā'lĭ, **CAPERCAILLIE,** or **CAILZIE,** kā'lĭ, a readily domesticated, polygamous grouse (*Tetrao urogallus*), about the size of a turkey, widely distributed throughout the pine-covered mountains of Europe. Formerly it inhabited Ireland and Scotland, where it was known as «blackcock,» but it was entirely extirpated toward the end of the 18th century. It has since, however, in small numbers, been restored to Scotland by stock imported from Scandinavia. The ground color of the cock is muddy black, spotted with gray and brown; quill feathers dark brown; tail feathers nearly black; a glossy dark green chest; whitish bill and a small patch of naked skin above the eye, which is scarlet. The feet are feathered to the toes. The hen and young are dark brown, covered with freckles of a lighter shade; neck and chest yellowish chestnut, and the feathers of the under part usually edged with white. It feeds chiefly upon berries, seeds, insects and the young shoots of the pine and other trees, which give its flesh a delicate turpentine flavor. They are hunted with the aid of dogs, which «tree» them, when they are easily shot. In the early spring, at the approach of the breeding season, the cocks meet at an accustomed place to give the hens the benefit of their annual «dances,» at which assemblies the hens seem to choose their mates by the amount of plumage, color, daring and extraordinary gestures which each displays. On such occasions the cock is oblivious to all else save the winning of his mate, and may easily be approached and killed. The female bird builds her nest on the ground among the pines, generally laying from 6 to 12 eggs, few of which reach maturity, owing to the carelessness of the mother. They are spotted red or yellowish brown, and are over two inches long. The bird is readily domesticated if it has the range of a space containing a few pine trees. Consult Lloyd, ‹Game Birds of Sweden and Norway› (London 1867); Morris, ‹British Game Birds› (ib. 1891); Darwin, ‹Descent of Man› (2d ed., ib. 1874); Millais, ‹The Natural History of British Game Birds› (London 1909).

CAPERN, Edward, English minor poet: b. Tiverton, Devonshire, 21 Jan. 1819; d. 1894. He was long in the mail service in his native county, and was often styled «The Postman Poet.» The poet Landor, attracted by the verse of Capern, procured him a pension from the civil list. His published works include ‹Poems by the Biddeford Rural Postman› (1856); ‹Ballads and Songs›; ‹Wayside Warbles›; ‹Sun-gleams and Shadow Pearls.› His verse is mainly descriptive of Devon life and character and a number of his lyrics were set to music by the poet himself.

CAPERNAUM, a city of ancient Palestine, on the west or northwest side of the Sea of Tiberias. This place is famous in Christian history, because Jesus often visited it during the time of his ministry, and in its vicinity he delivered the Sermon on the Mount. Nothing of the city now remains.

CAPERS, Ellison, American Protestant Episcopal bishop: b. Charleston, S. C., 14 Oct. 1837; d. Columbia, S. C., 22 April 1908. He was graduated at the South Carolina Military Academy 1857, and was a professor there 1858–60. He entered the Confederate army, was successively major, lieutenant-colonel and brigadier-general, and received several severe wounds. He was secretary of State of South Carolina in 1867–68, then entered the Protestant Episcopal ministry, and was rector of Christ Church, Greenville, S. C., for 20 years, and at Columbia, S. C., for six years where he remained until his elevation to the episcopate. He was secretary and treasurer of the diocesan board of missions 1879–93 and deputy to the general conventions of 1880, 1883, 1886. In 1893 he was consecrated seventh bishop of South Carolina, succeeding Bishop Howe.

CAPERS, William, American Methodist Episcopal bishop: b. South Carolina 1790; d. 1855. He was educated at South Carolina College, became an itinerant preacher and ministered to the Indians in Georgia from 1821 to 1824. He was presiding elder in Charleston for four years and for a short time was editor of the *Wesleyan Journal,* later merged in the New York *Christian Advocate.* In 1837 he founded and edited the *Southern Christian Advocate.* He also did missionary work among the negroes. In 1846 at the first general conference of the Methodist Episcopal Church he was chosen bishop. Consult his autobiography, with memoir by Wightman (Nashville 1858).

CAPERS, the unopened flower-buds of a low shrub (*Capparis spinosa*), which grows from the crevices of rocks and walls and among rubbish in the southern parts of France, in Italy and the Levant. The stems of the Caper-bush are trailing and two or three feet long. In the south of France the caper-bush is very common. It grows wild upon the walls of Rome, Siena and Florence, and, when trained against a wall, flourishes even in the neighborhood of Paris. It was introduced into Great Britain as an exotic as early as 1596. Modern horticulturists are of opinion that with care it might be raised in the open air in England, but this has never been accomplished to any practical extent. It is cultivated on a large scale between Marseilles and Toulon and in many parts of Italy. In northern United States it is propagated by cuttings in greenhouses, but is grown from seed in the Southern States. In the early part of summer it begins to flower, and the flowers continue successively to appear until the commencement of winter. The buds are picked every morning before the petals are expanded; and as they are gathered they are put into vinegar and salt. When a sufficient quantity is collected they are distributed, according to their size, into different vessels, again put into vinegar, and then packed up for sale and exportation. The smallest capers are the dearest, simply from the reason that they are more troublesome to gather. This pickle is much used in sauce for boiled mutton. To persons unaccustomed to it the taste of capers is unpleasantly sharp and bitter, but after a little while the palate becomes reconciled to it. The flower-buds of the marsh-marigold (*Caltho palustris*) and the seeds of nasturtiums are frequently pickled and eaten as a substitute for capers. The bark of the root of the caper cut into slices and dried in small rolls or quills is sometimes used in medicine as a diuretic and in cases of obstruction of the liver. The caper-tree (*Capparis Jamaicensis*) is found in tropical America.

CAPERTON, Allen Taylor, American Confederate statesman: b. near Union, Monroe County, Va. (now West Virginia), 21 Nov. 1810; d. Washington, D. C., 26 July 1876. After attending school in Huntsville, Ala., and entering the University of Virginia, he went to Yale, where he was graduated in 1832, and studied law at Staunton, Va. He was a director of the James River and Kanawha Canal, and served in both houses of the Virginia legislature, his last term in the senate being in 1859–60. He was a member of the Constitutional Convention of 1861, and opposed secession until the beginning of hostilities. He was elected to the Confederate States Senate in 1863, and served till the fall of the Confederacy in the spring of 1865. He was chosen to represent West Virginia in the United States Senate for the full term beginning 4 March 1875, and was a member of the committees on claims, railroads and the revision of the laws. After the close of the war Caperton took an active part in bringing the coal, timber and grazing lands of West Virginia to the notice of distant capitalists.

CAPERTON, William Banks, American naval officer: b. Spring Hill, Tenn., 30 June 1855. He was graduated at the United States Naval Academy in 1875. Through the various grades of the service he rose to the rank of lieutenant in 1889. He has had over 23 years of sea service and about 19 years of shore and other duty. He has seen service in every sea, and has shown that he is one of the great men of the United States navy. He was an officer on board the *Marietta* when she accompanied the *Oregon* in her famous race from the Pacific to the Atlantic to take part in the fight with Admiral Cervera's fleet in the Spanish War. Previous to that he was one of the young American naval officers who were sent to Paris to the Exposition there in 1878. He was at one time assigned to duty with the coast and geodetic survey and served as an officer aboard the *Vesuvius*. He was in command of the naval station at Newport, R. I., and supervisor of the second naval district 1913–14. He was named rear-admiral in 1913 and was assigned to the command of the cruiser squadron of the Atlantic fleet in 1915. In 1914–15 he was in the Caribbean trying to bring peace to the war-torn republics of Hayti and San Domingo. When it was time to fight he showed that he was a fighter, and he has been equally proficient in diplomacy. He brought the most turbulent of the revolutionary leaders at least to make believe they liked peace. In July 1916 he was promoted to admiral «for valuable and satisfactory service in Hayti and San Domingo and his efficient record as a high executive officer.» On 29 July 1916 he took command of the Pacific fleet, succeeding Admiral Winslow.

CAPES, Bernard, English novelist. His works include 'The Lake of Wine' (1898); 'The Adventures of the Comte de la Muette' (1898); 'Our Lady of Darkness'; 'At a Winter's Fire' (1899); 'From Door to Door' (1900); 'Joan Brotherhood' (1900); 'Love Like a Gipsy' (1901); 'A Castle in Spain' (1903); 'A Jay of Italy' (1905); 'A Rogue's Tragedy' (1906); 'The House of Many Voices' (1911); 'The Story of Fifine' (1914); 'The Fabulists' (1915).

CAPET, kā-pā, or kăp'ā, the name of the French race of kings, which has given 118 sovereigns to Europe, namely, 36 kings of France, 22 kings of Portugal, 11 of Naples and Sicily, 5 of Spain, 3 of Hungary, 3 emperors of Constantinople, 3 kings of Navarre, 17 dukes of Burgundy, 12 dukes of Brittany, 2 dukes of Lorraine and 4 dukes of Parma. The history of this royal race is, at the same time, the history of the rise and progress of the French monarchy. The fate of one of the most interesting countries and nations in Europe is connected with the name of Capet. After having been deprived of four thrones, and again restored to them, this family stood forth as the first and most ancient support of the European principle of political legitimacy, that divine right, which in this house commenced with treason. Its origin is remarkable. Pepin the Short, the father of Charlemagne and mayor of the palace under the Merovingian dynasty, had displaced that royal house and usurped the throne of the ancient kings of the Franks. After a space of 235 years his own descendants, the Carlovingian monarchs, experienced a similar fate. Under the last Carlovingians, destitute alike of energy and wisdom, Hugh the Great, Duke of France (by which was then understood the Isle of France), Orleans and Burgundy, exercised a power as unlimited as that of the mayor of the palace under the Merovingians. On the death of Louis V, without children, in 987 his uncle, Charles, Duke of Lower Lorraine, laid claim to the throne, which the Franks had sworn to preserve to the family of Charlemagne. The French nobility, disgusted at the German leanings of the Carlovingians, whose domains and influence lay in the eastern provinces, preferred that a member of their own class, whose possessions were situated in the centre of the country, and whose power was so great as to outrival that of the old dynasty, should rule over them, and accordingly chose as their king Hugh, son of Hugh the Great, Duke of France and Count of Paris, and had the support of the Church in their favor. The valiant Charles of Lorraine was surprised in Laon by the treachery of a bishop and made prisoner. He died soon afterward in prison, and his son, Otho, Duke of Lower Lorraine, died in 1006. Both his younger brothers died childless in Germany. Thus the race of Capet was left in possession of the throne of France. According to some historians, Hugh Capet was descended from a Saxon family. He married a German princess, Adelaide, daughter of King Henry I of Germany (Duke of Saxony). Hugh was crowned at Rheims, and swore to preserve to the nation, and particularly to the powerful feudal nobility and clergy, all their existing privileges. Hugh and the succeeding monarchs, till Louis VII, took the precaution to have their successors invested with the royal title during their own lifetime. Thus Hugh had his son, Robert, crowned and anointed as his colleague as early as 1 Jan. 988. He abolished by law the partition of the hereditary estates among the sons of the kings and forbade the alienation of the family domains. The daughters of the kings were endowed from that time with money, and the appanage which was given to the princes of the blood returned to the Crown in default of male heirs. Both these principles were more fully confirmed by later laws. Thus Hugh Capet, by uniting his hereditary duchy, consisting of Paris, Isle of France and Burgundy, inalienably with the Crown, may be regarded as the founder of the French monarchy. What he had begun was completed by his successors, particularly in the times of the Crusades, and by the establishment of standing armies. On the failure of the direct line at the death of Charles IV (1328) the French throne was kept in the family by the accession of the indirect line of Valois, and in 1589 by that of Bourbon. Capet being thus regarded as the family name of the kings of France, Louis XVI was arraigned before the National Convention under the name of Louis Capet.

CAPGRAVE John, English historian: b. Lynn, Norfolk, 1393; d. there 1464. The most of his life was passed in the Augustinian friary of his native place. He was provincial of the order of Austin Friars in England, and was one of the most learned men of his day. He wrote in Latin numerous commentaries, sermons and lives of the saints. His most important work was his ‘Chronicle of England,’ in English, extending from the creation to the year 1417. Other works were a ‘Liber de Illustribus Henricis’ and a ‘Life of Saint Katherine.’ Many of his works are lost, others have never yet been printed. His ‘Chronicle’ and his ‘Liber de Illustribus Henricis’ have been edited by F. C. Hingeston and printed in the Rolls series (London 1858).

CAPHTOR, the country in which the Philistines originated mentioned in Deut. ii, 23; Jer. xlvii, 4, and Amos ix, 7. Until recently the location of Caphtor was not certain; it had been variously identified with Cappadocia, Cyprus, Crete and Cilicia. It is now practically certain that it was Crete on account of the frequent connection of the Philistines with the Cherethites (or Cretans). Consult Hall, ‘Keftin and the Peoples of the Sea’ (in *Annual* of the British School, Vol. VIII, pp. 157ff. and cf. Vol. X, p. 154, Vol. XIV, p. 254); Müller, W. M., in ‘Mitteilungen der vorderasiatischen Gesellschaft’ (1900), and Meyer, Ed., ‘Geschichte des Altertums, (I, 2, pp. 798ff.; 3d ed., 1913).

CAPIAS, kăp'ē-ăs ("that you take"), a writ or process in a civil action whereby the sheriff is ordered to arrest the body of the defendant. The writ so framed as to call for the arrest of the defendant before judgment, in order to compel him to answer a suit, is called a *capias ad respondendum;* if after the judgment, to compel him to satisfy the judgment, it is called a *capias ad satisfaciendum*, commonly abbreviated *ca. sa.* In case of injuries without force, the civil law, and originally the common law, did not authorize the arrest of the defendant before judgment, that is, the arrest to answer; and upon feudal principles, says Sir William Blackstone (3 Com. 281), "the person of a feudatory was not liable to be attached for injuries merely civil, lest thereby the lord should be deprived of his services." The first writ of *capias ad respondendum* was given by act of Parliament in 1267, 52 Hen. III, c. 23, § 1, which provided that "if bailiffs, which ought to make account to their lords, do withdraw themselves, and have no lands nor tenements whereby they may be restrained, they shall be attached by their bodies, so that the sheriff shall cause them to come to make their account." This act applied to a particular description of receivers, and supposed them not only to be debtors, but also to have in their own hands the evidence of the amount of the debt, the production of which was one object of the process. The statute of 13 Edw. I, c. 11, passed in 1285, 18 years after the former, extends this process to "all manner of receivers bound to yield account," and provides "if they be found in arrearages upon this account, their bodies shall be arrested, and, by the testimony of the auditors, shall be sent into the next jail, and be imprisoned in irons under safe custody, and remain in prison at their own cost until they have satisfied their master (the creditor) fully of their arrearages." It would appear that the practice of arresting on mesne process, that is before judgment, to answer in civil suits, grew out of these statutes; for the subsequent statutes of 25 Edw. III, c. 17 (1350), providing that "such process shall be made in writ of debt, detinue of chattels and taking of beasts, by writ of *capias*, as is used in writ of account"; and of 21 Hen. VII. c. 9 (1503); evidently have reference to an arrest to answer. Formerly, a writ upon which a suit was commenced was either a *capias,* distress or summons; either the person of the defendant was seized, and (unless he was bailed) imprisoned until the trial, or his goods and lands were seized as a guarantee of his appearance to answer; and more often, in modern times, to obtain a lien to secure satisfaction of the judgment; or he was only summoned, that is, merely had notice that a suit had been commenced before such a court, by such a plaintiff, and was to be heard at such a time. The commencement of an action by summons is now the usual course of procedure; recent legislation, and especially the practical abolition of imprisonment for debt, having greatly restricted the use of writs of *capias* of any kind. By the Debtors' Act, 1869 (32 and 33 Vict. c. 62), the writ of *capias ad satisfaciendum* is abolished, except in cases in which the defendant can pay, but will not. The same act provides that when a plaintiff has good cause of action against a defendant to the amount of £50 or upward, and the defendant is about to quit England, and the absence of the defendant from England will materially prejudice the plaintiff in the prosecution of his action, a judge may order the defendant to be arrested unless or until security be found. A supplementary or second writ, issued when an ordinary capias has been placed in the hands of the sheriff and has been returned with the endorsement that the defendant could not be found, is called a *testatum capias.* See ARREST; ATTACHMENT; EXECUTION.

CAPILLARIES, the extremely minute blood vessels that make the connection between the arteries and the veins. They are extremely abundant, being present in practically all parts of the body and in enormous numbers. It is by means of the capillaries that most of the interchange of nutrition takes place in the various tissues of the body. The arteries bring the fresh oxygenated blood to the parts, to which it is distributed by the rich network of capillaries, through the walls of which the waste products pass and are carried on by the blood pressure into the veins, to be eliminated by some one of the large excretory organs, the liver, etc., or carried to the lungs to be thus modified or cast off. The arrangement, width and capacity of the capillaries varies in every tissue of the human body. In general they are arranged as a close network about the parts to which they are distributed, and in width they vary from one two-thousandths to one two-hundredths of an inch in diameter. They are largest in the marrow of bone and smallest in the brain. In muscular tissue they are generally parallel one to another, but in numerous cases, as around fat cells, they are arranged spherically and in the intestines they form loops. See ARTERIES; BLOOD, CIRCULATION OF.

CAPILLARITY. The subject of capillarity takes its name from the circumstance that it was first studied in connection with the rise of liquids in tubes having a bore so fine as to be comparable in diameter with a hair (*capillus*). When one end of such a tube is immersed in water, the water rises in the tube above the general level of the surface outside it, in a way which is not in accord with the general law of hydrostatics, that a liquid will stand at the same level in two communicating vessels. Many other instances can be found in which liquid surfaces, especially in the neighborhood of solid bodies, assume shapes and positions which are equally at variance with the laws of hydrostatics. All such cases are now treated as belonging to the general subject of capillarity. Examples of capillary actions are the soaking up of water by a sponge; the penetration of varnish into wood; the rising of oil in a lamp wick; the clinging of ink to a properly nibbed pen; the running off of the ink from pen to paper; the soaking up of the superfluous ink in blotting paper; the falling of drops of uniform size from the lip of a bottle or from a medicine dropper; the rounding of drops of melted lead into pellets of shot as they fall in a shot-tower.

When we consider such examples as these, it becomes clear that they are to be explained as the result of forces acting between the parts of the liquid, or between the liquid and the solid with which it is in contact. These forces are often called the forces of cohesion and adhesion. Very little is known about them. The one thing definitely known is that they are very great when the parts of the body or bodies between which they are exerted are so near together that they are said to be in contact, and fall off rapidly in magnitude as the parts are separated, so as to become inappreciable when the distance between the parts becomes discernible. It is customary to think of these forces as exerted between the molecules of matter, and so to call them molecular forces. The very small distance within which the action of a molecule on its neighbors is appreciable is called the range of molecular action.

By reflection upon the effects of such molecular forces acting in a liquid, Young (1804) was led to assume that a tension exists in a thin layer of molecules at the surface of a liquid, comparable in general to the tension in a stretched membrane. The magnitude of this surface tension depends upon the nature of the liquid, or, more exactly, upon the nature of the two media, of whatever sort they may be, separated by the surface. It is independent of the shape of the surface, provided that its radii of curvature are always great in comparison with the range of molecular action or the thickness of the surface layer. Young added to this hypothesis the observation that the angle of contact between a liquid surface and a solid is always the same for the same pair of substances. The angle of contact is generally measured, at the line of contact, between the external normals to the solid and the liquid surfaces. In the case of mercury and glass, which Young particularly observed, this angle is obtuse, and seemed to him to be about 135°. In the case of water and glass it is acute, and so small as to seem evanescent, or equal to zero. Young assumed that the like is true for all contacts of liquids with solids which are wetted by them.

Young's two principles are clearly not proved to be consequences of the more fundamental hypothesis of molecular force; but, accepted as generalizations from observation, they may be used to explain all the forms of liquid surfaces. For example, let us consider the rise of water in a glass tube. The water wets the inner wall of the tube, and so meets it everywhere in the circle of contact at an angle equal to zero. Owing to this, the surface of the water in the tube will be concave upward. In a tube of very small bore, it will be approximately hemispherical. The tension strives to straighten out the surface, and since the contact condition prevents its doing this, it lifts a column of water up the tube, to a point such that the weight of the uplifted column is sustained by the upward force due to the tension, while at the same time the curvature of the surface is consistent with the contact condition.

When the column is stationary, the tension in the surface can be considered as acting vertically upward at all points in the circle of contact of the surface with the wall of the tube. Representing by T the tension in the surface, or the force acting in the surface across a line of unit length, and by r the radius of the tube, we have the expression $2\pi rT$ for the upward force acting on the column. Representing by ρ the density of water, by g the acceleration of gravity, and by h the height of the column above the general level of the water surface outside the tube, we have the expression $\rho g\pi r^2h$ for the weight of the column. Setting the two forces equal, we obtain $2T=\rho grh$, and conclude that the height of the column is inversely as the radius of the tube. This law was made known by the experiments of Jurin (1718), and is generally known as Jurin's law.

By a slight extension of Young's conception of surface tension, we may deduce from it the constancy of the contact angle. We need only to suppose that a tension exists, in any surface separating two substances, which has a particular value for each pair of substances. Consider then three fluids in contact along a line. It is evident that the line of contact will be at rest when the angles made with each other, at that line, by the three surfaces in which the fluids meet in pairs, are such that the tensions in the three surfaces are in equilibrium. These angles are therefore obtained by constructing the triangle of forces, with the three tensions as sides, and they are constant, for the three substances.

We may consider more particularly the special case in which one of the three substances is a solid. Suppose, for convenience in statement, that the three substances are a liquid, air and a solid. Represent by T_{12}, T_{13} and T_{23} the tensions in the surfaces separating the liquid from air, the liquid from the solid, and air from the solid, respectively. Denote the angle of contact of the liquid-air surface with the solid by ϕ. The line of contact will be at rest when the sum of all the tensions or components of tension in the plane of the solid is equal to zero, or when

$$T_{12}\cos\phi+T_{13}-T_{23}=0.$$

The angle of contact is therefore given by

$$\cos\phi=\frac{T_{23}-T_{13}}{T_{12}},$$

and is constant. It is acute or obtuse, according as T_{23} is greater or less than T_{13}. In the case of mercury and glass, T_{13} is the greater, and ϕ is obtuse. In the case of most liquids and glass, the tension corresponding to T_{23} is the greater, and ϕ is acute. When T_{23} equals or exceeds $T_{12}+T_{13}$, the angle ϕ becomes evanescent.

Almost contemporaneously with Young, Laplace (1805) formally applied the hypothesis of molecular forces to the study of the forms of liquid surfaces. He considered the pressure at the end of a liquid filament, beginning in the surface and drawn normal to it, and terminating in the interior of the liquid. He proved that it may be expressed by the sum of two pressures. One of these, called the molecular pressure, is very great, and is constant at all points of the liquid that are not in the surface layer. This pressure is eliminated from all equations of equilibrium of liquids, and plays no part in determining the forms of liquid surfaces. The other pressure depends upon the shape of the liquid surface, and is given by the formula $\left(\frac{H}{2}\frac{1}{R}+\frac{1}{R'}\right)$, in which H is a constant, and R and R' the two principal radii of curvature of the surface. This pressure, at any point under the surface layer, is in equilibrium with the hydrostatic pressure at that point. Under a flat surface, and therefore under the level surface of a large expanse of liquid, the radii of curvature are infinite and this pressure vanishes. If h is the height of a point in the curved surface above the general level, we then have for equilibrium the condition $\frac{H}{2}\left(\frac{1}{R}+\frac{1}{R'}\right)=\rho g h.$ This relation may be deduced from Young's hypothesis of surface tension, and it is found that Laplace's constant H is equal to $2T$. As an example of the use of this equation, consider again the rise of water in a tube. The surface in the tube, if its bore is small enough, may be considered a hemisphere, and therefore $R=R'=r$, the radius of the tube. Accordingly we have $H=\rho grh$, as we obtained before by Young's method.

Laplace's theory did not suffice to demonstrate the constancy of the contact-angle, and Laplace was forced to assume it as a fact of observation.

A more profound and successful application of the hypothesis of molecular forces to the problem of capillarity was made by Gauss (1829). He showed, by means of the principle of virtual work, that a system of substances in contact possesses a certain amount of potential energy arising from the molecular forces. For each pair of substances the energy is proportional to the extent of surface separating them, and the factor of proportion is a characteristic constant for the two substances. This constant is called the surface energy. The existence of such a surface energy may readily be deduced from the hypothesis of molecular forces. Consider, for example, a mass of liquid surrounded by another liquid of the same specific gravity. If its surface is enlarged, it can only be by the movement of some of its parts out of its interior into the surface layer, and it is evident that, as they move out through the layer, work is done against the molecular forces, which will be proportional, generally, to the area by which the surface is increased. The liquid acquires potential energy equal to the work done in increasing its surface. As the potential energy of a system in equilibrium is always a minimum, the condition of equilibrium of such a mass of liquid is, therefore, that the area of its surface shall be a minimum. If the liquid is entirely free, its surface will be spherical. If it is subject to conditions, so that portions of the surface are limited by certain fixed boundary lines, it may be proved that the forms of the various portions of the surface, which will make the surface energy a minimum, are such that the sum of the reciprocals of the principal radii of curvature is the same for all parts of all the surfaces. We are thus led to the same rule for the form of a liquid surface as that reached by Laplace.

It may be shown that the constants denoting the surface energy and the surface tension are the same. To do this, consider a film of liquid bounded by the sides of a rectangle, one of which can be moved so as to increase or diminish the area of the film. Since both faces of the film act alike, we need consider only one of them. The force applied by the tension T in the film to the movable side, the length of which is represented by s, is Ts; and if the movable side moves in toward the opposite side through the distance r, the work done by the surface tension is Tsr. This is, therefore, the measure of the change in the energy of the film, and since sr is the change of area, T equals the energy per unit of area, or the surface energy.

The method of Gauss furnishes a proof that the contact-angle should be constant. If we consider that the potential energy of the system is a minimum, when the surface tensions which arise from the surface energies are in equilibrium, this may be proved in the way already indicated; or a direct proof may be given.

The argument by which these conclusions have been reached fails if we take into consideration the heat that must be introduced into the surface film to keep it at constant temperature during its enlargement. When this heat is taken into account it appears that the surface energy differs from the surface tension by a quantity equal to the product of the absolute temperature and the rate at which the surface tension changes with the temperature. In all known cases the surface tension decreases as the temperature rises and the surface energy is greater than the surface tension. The surface tension, while not equal exactly to the total surface energy, is equal to the so-called free energy of the surface. Since equilibrium depends on the free energy having a minimum value, the test of equilibrium based on the condition that the area of the liquid surface shall be a minimum, consistent with the boundary conditions, is not impaired by this modified statement.

A very interesting set of verifications of the theories of capillarity was devised by Plateau. In order to be able to examine a liquid taking shape under its surface tension only, he prepared a mixture of alcohol and water having the same density as olive oil, in which the oil could be suspended. A mass of oil, freely floating in this mixture, assumed a spherical form. This form is manifestly that which would be produced by a tension acting uniformly in all parts of the surface; it is also that for which the internal pressure represented by $\frac{H}{2}\left(\frac{1}{R}+\frac{1}{R'}\right)$ is the same everywhere; and also that for which the surface, and consequently the potential energy, is a minimum. When the oil was suspended in a wire frame, it assumed various forms, depending on the shape of the frame and the quantity of oil, which were always such that the internal pressure, determined by Laplace's equation, was the same everywhere.

A similar set of verifications was afforded by the use of films of soapy water. Such films are so thin and light that their weight hardly distorts them at all, and the positions they assume are due almost solely to the surface tension. Such a film, blown into a bubble, is spherical. When formed on a wire frame lying in a plane, the film is a plane. When the frame is twisted out of the plane, the surface of the film is the least that can be constructed with the edges of the frame as a boundary. It is one of the so-called minimal or ruled surfaces. Various films of this sort were examined by Plateau, and found to fulfil the geometrical conditions of the minimal surface.

Observers have ordinarily tested the theory by determining, from Laplace's equation, the various forms and dimensions of liquid surfaces, subject to various boundary conditions, and comparing the actual forms obtained by experiment with those deduced from the theory. For example, rough observations show that for any one liquid that wets glass, the heights to which it rises in various capillary tubes are inversely as the radii of the tubes, as the elementary theory declares they should be. More refined observations show that this statement is not strictly accurate, and a more complete theory leads to certain corrections of the statement, to which the better observations conform. In a similar way, the rise of a liquid between parallel plates, the forms of large drops of mercury on a horizontal plate, or of large bubbles of air in a liquid under a horizontal plate, the force needed to lift a horizontal plate from the surface of a liquid which wets it, the maximum pressure exerted in a small bubble as it is enlarging in a liquid at the end of a tube, have all been used as means of testing the theory. Generally the observations are used in the appropriate formula to obtain a value for the surface tension T, or for the constant $a^2=\frac{2T}{pg}$ (Called Poisson's constant) and the verification of the theory is found in the fact that the values of these quantities obtained by different methods are in good agreement with one another.

The determination of the surface tension is complicated by the fact that many of the formulæ containing it involve the contact-angle also. In such cases the contact-angle may be determined by an independent observation, as was done by Young in the case of mercury in contact with glass; but in most cases the liquids examined wet, or seem to wet, the solid walls, and it is then assumed that the contact-angle is evanescent or zero. The results obtained on this assumption may be compared with those obtained by methods in which the contact-angle is not involved, to test the validity of the assumption, and if it is found in error, to determine the magnitude of the contact-angle.

It is of interest to consider some examples of the constants of capillarity. The units commonly employed are not those of the absolute c. g. s. system. It has been found more convenient to use the millimetre as the unit of length, and the weight of a milligram as the unit of force. Poisson's constant a^2, being always determined, as in the example given of the rise of a liquid in a tube, by the product of two lengths, is a number of square millimetres. The surface tension T, or the force which acts across a unit of length in the surface, is expressed in milligram weights per millimetre. In these units Poisson's constant for mercury is about 6.75, and the surface tension 45.7. For water at 20° C. we may take $a^2 = 15.0$ and $T = 7.5$; for chloroform at 23° C., $a^2 = 3.7$, $T = 2.73$; for refined petroleum at 22° C., $a^2 = 6.75$, $T = 2.64$. These numbers are simply cited as examples of the magnitude of the two constants in typical cases. Their exact determination is beset with such difficulties that it is doubtful whether any results have been obtained which can be accepted as definitive.

The constant contact-angle of mercury with glass is about 135°, or a little larger. Most liquids wet glass, and their contact-angles are assumed to be 0°. Evidence has been adduced to show that in some cases, with water or petroleum, for example, the contact-angle with glass is not 0°, but has a finite, though not a large, value. This question is not yet definitely settled.

The principal difficulty in determining the constants of capillarity with accuracy lies in the effect of impurities on the surface tension. This is especially felt with the liquids which have high surface tension, like mercury or water. The least trace of oil or grease will spread out over a water surface in a thin film, and alter its surface tension very considerably. It is very difficult to get the vessels clean, which are used in the experiments, and much more difficult to keep them clean, so that the constants obtained for any liquid are always open to a certain degree of suspicion. Impurities dissolved in the liquid affect the surface tension also, though not to so great a degree as those which spread over its surface.

The surface tensions, of all liquids which have been tested, become less as the temperature rises. It has been shown to be a consequence of the principles of thermo-dynamics that, provided the specific heat of the liquid is independent of the extent of its surface, the amount by which the surface tension changes is proportional to the change in the absolute temperature. Most of the older measurements of the temperature coefficients do not confirm this conclusion, but the observations of Knipp on water and of Feustel on various organic liquids are in agreement with it.

The magnitudes of the constants of capillarity manifestly depend on the magnitudes of the forces between molecules and on the range of molecular action. The theory of van der Waals leads to an estimate of the molecular pressure within a liquid, the values obtained for it ranging from 1,430 atmospheres in the case of ether to 10,700 atmospheres in the case of water. The same theory indicates that the range of molecular action is proportional to the linear dimensions of the molecule, and is of about the same magnitude as the radius of the molecule. By the help of a modified form of this theory, Eötvös came to the conclusion that the rate of variation with the temperature of the product of the surface tension and the two-thirds power of the molecular volume should be constant, and the same for all liquids, within a certain temperature range, if their molecules are single, and not double or compound. Observation shows that this law holds true for many liquids, and in cases in which it fails, there are often other reasons to support the conclusion that the molecules of the liquid are compound.

Before closing, we may consider a few examples of the effects produced by surface tension.

When waves are set up on the surface of water, they are transmitted across the surface at a rate which depends on the hydrostatic pressure and on the surface tension. The surface tension is practically the only agent in transmitting the waves when they are very short. Such waves may be set up by the use of a vibrating tuning fork, and the measurement of their lengths furnishes a means for the determination of the value of the surface tension. The ripples set up on the smooth surface of a pond by a breath of air, or which proceed in front of a slowly moving boat, are largely due to surface tension.

When a glass tumbler is partly filled with water, the surface tension draws the water up the sides. As more water is carefully poured in, the line of contact rises until it reaches the edge of the glass. It often happens that the line of contact is checked at the edge, so that the water does not run out over the top of the glass. In this case the glass can be filled above the level of its edge, and the water will stand in it under a surface that is convex upward, the surface tension in which keeps the water from running out.

The surface tension in the convex surface of the mercury in the tube of a barometer produces a pressure downward, which has to be estimated and allowed for when accurate observations are to be made.

A fine needle that has been slightly oiled or greased if laid gently down on the surface of water will float there. It lies in a concave trough formed in the water surface. The water cannot wet the needle, because of its coating of oil, and so the needle is supported by the uplift due to the surface tension acting in the concave surface in which the needle rests. In a way generally similar, the insects which run over the surface of water are supported in little hollows in the water surface. Their feet are not wetted by the water.

When two light bodies, floating on the surface of a liquid, are moved toward each other until the curved parts of the liquid surface near them intersect, they seem to exert forces on each other. If they are both wetted by the liquid, or are both not wetted by it, they move together and adhere to each other. If one of them is wetted by the liquid and the other not, they move apart. If water is run in between two parallel sheets of plate glass, they are drawn closely together and adhere very strongly to each other. These actions are ascribed to differences in the pressures on opposite sides of the bodies. In case the bodies are wetted by the liquid, the pressure in the region between them, in the elevated portion of the liquid under its concave surface, is less than the pressure on their outer sides and they are pushed together. This action takes place even in a vacuum, in which case the pressure under the concave surface is a negative pressure or tension. In case the bodies are not wetted by the liquid the liquid is depressed between them, and the pressure inward on their outer sides is greater than that acting outward, and they are pushed together. A curious effect, predicted by Laplace from the theory of capillarity, and verified by experiment, is exhibited by two bodies, one of which is wetted by the liquid and the other not. These bodies, as the distance between them is diminished, at first appear to repel each other, but as the distance is reduced the repulsion changes to an attraction and the bodies come together.

If a small lump of camphor is dropped on clean water, it begins to move about over the surface in an irregular way, and continues to do so, generally for some time. These motions are explained by noticing that one part of the lump of camphor dissolves more freely than the rest, and so, near it, the surface tension of the water surface is lowered below that near the other parts of the lump. The camphor is accordingly drawn toward that part of the surface in which the tension is greatest.

If a thread of water is at rest in a horizontal capillary tube, and one of its two end surfaces is touched by a wire that has been dipped in turpentine or benzine, the tension at that end will be diminished, and the greater tension of the other end will draw the water along the tube. This effect is taken advantage of in cleaning off grease spots from cloth. The surface tension of benzine is very low, and when benzine is applied in a gradually narrowing ring around the spot of grease, the grease is drawn in toward the centre of the ring, and if the cloth is laid on a piece of blotting paper, the grease will be taken up by it. This action is promoted if a hot iron is applied to the other side of the cloth, for the heat lessens the tension in the ends of the pores nearest the iron, and the greater tension at the other ends draws the grease into the blotting paper. Consult Boys, 'Soap Bubbles, and How to Blow Them' (New York 1900; new ed., London 1912); Lord Rayleigh, 'Collected Scientific Papers' (1901).

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CAPILLARY ATTRACTION. See Capillarity.

CAPILUPI, kä-pĭ'-loo-pĭ, **Camillo,** Italian poet: b. Mantua 1504; d. 1548. He was the author of a work issued in 1572 entitled 'The Stratagem of Charles IX against the Huguenots,' in which the massacre of Saint Bartholomew was justified, and which made the action appear premeditated. Cardinal Lorraine, who at the time was attending the Pope in Rome, endeavored to suppress the book from motives of policy.

CAPISTRANO, kä-pē-strä'nō, **Giovanni di,** or **CAPISTRANUS, Johannes, Saint,** Italian monk: b. Capistrano, a small Neapolitan town of the Abruzzi, 24 June 1386; d. Illock, Slavonia, 23 Oct. 1456. He at first studied law, but in his 30th year, impelled by a vision, entered the Franciscan order, and was soon distinguished by the austerity of his manners, and a great zeal against the numerous heretical sects in Italy. The Popes Martin V, Eugene IV and Felix V, often employed him as legate and inquisitor in suppressing the sect of the Fraticelli, which had spread widely over Naples and the Papal States. In 1444 he became vicar-general of the strict order of Franciscans called Observants, and in 1450 proceeded as legate to Germany with a view to suppress the Hussites, and rouse the Germans to a crusade against the Turks. Although he was successful in his opposition to the Hussites in Moravia, he was expelled from Bohemia by George Podiebrad. His fanaticism often led him into many acts of cruelty, one of the worst being the racking and burning of 40 Jews in Breslau, on the charge of profaning the Host. His harangues in favor of a crusade against the Turks failing to make much impression on the German princes he resolved to try their effect on the populace, and easily persuaded great numbers to join him in marching against the Turks, who were advancing under Mohammed II, and had closely invested Belgrade, the key of Hungary, with an army of 150,000 men. At the instigation of Capistranus, John Corvinus Hunnyades furnished a force of 60,000, destroyed the Turkish fleet on the Danube, and threw into Belgrade succors both of men and provisions. On this expedition Capistranus in person commanded the left wing of the party, forced his way into Belgrade, repulsed a general assault by the Turks, and on 6 Aug. 1456, in conjunction with Hunnyades, signally defeated the whole Turkish host. His exertions, and the pestilential atmosphere caused by the dead bodies lying unburied around Belgrade, laid him on a sick-bed, and he died in the same year in the Franciscan monastery at Illock. He was beatified in 1690 and canonized in 1724 by Benedict XIII. He was the author of 'Speculum Conscientiæ.' Consult Jacob, 'Johannes von Capistrano' (2 vols., Breslau 1903-06).

CAPISUCCHI, kä-pe-sook'kē, or **CAPIZUCCA, Biago,** or **Biasio,** Marquis of Monterio, Italian general: b. Rome about the middle of the 16th century; d. Florence 1613. He was in the service of Spain in the Low Countries, under the Duke of Parma, in 1584, afterward becoming lieutenant-general and commander of the army of Ferdinand I de Medici, Duke of Tuscany. He fought the French Protestants in the reign of Charles IX, and distinguished himself at Clain, near Poitiers, in 1569.

CAPISUCCHI, Paolo, Italian ecclesiastic: b. Rome 1479 d. there 1539. Having become bishop of Neocastro he was summoned to Rome by Clement VII, who referred to him the question of a divorce between Henry VIII of England and Queen Catherine. In this matter Capisucchi made a report against Henry in 1534.

CAPITAL. Capital as a factor in the modern economic system is wealth, other than land, which is used by its owner to secure an income rather than for direct enjoyment. Land as a natural agent is usually treated in a class by itself, and is distinguished from products of human industry and enterprise. These products are subdivided, according to the uses to which they are put, into producers' goods and consumers' goods. Producers' goods include all tools, machines, buildings and appliances which are used in production, while consumers' goods include only such goods as are used for direct enjoyment. Capital includes all producers' goods, and some consumers' goods. It includes all producers' goods since they are not used for direct consumption or enjoyment, but rather for the purpose of securing other goods. The term capital, however, is usually made to include, in addition to producers' goods, such consumers' goods also as are used by their owners for the purpose of securing an income. A pleasure automobile which is let for hire is a consumer's goods from the standpoint of society, but it is capital to its owner, since he gets no consumer's enjoyment from it. He keeps it for the income which it brings him. A dwelling-house is likewise a consumer's goods; but if it is rented, it is capital to its owner. Some writers have accordingly spoken of two kinds of capital, first, social or productive capital, and second, private or acquisitive capital. Social or productive capital is synonymous with producers' goods, while private or acquisitive capital includes such consumers' goods as are let, rented or hired by their owners to other people.

Capital is sometimes thought of not as a class of goods but as a fund of value. There are two reasons which lead to this way of thinking. In the first place, however capital may have originated historically, the characteristic method through which one comes into possession of it nowadays is that of purchase and the means of purchasing is money. Whatever the form of capital which one ultimately possesses, it is almost certain to be in the form of money at one time or another. It is, of course, a mistake to say that capital is money. A work-horse is a form of capital, but capital is not work-horses, neither is capital money, though money is a form of capital. Money may be used as a tool or a means of accomplishing more than could be accomplished without it. After one comes into the possession of money, he then has the power of exchanging it for consumers' goods or for sources of income as he may choose. If he decides to purchase sources of income, he is said to invest his capital. As a matter of fact, he is merely exchanging one form of capital for another. This habit of speaking as though one had invested capital when one had merely invested money, has led naturally to the idea that capital is money.

Another reason is found in the fact that capital, like all wealth, is measured in terms of money, and its quantity so expressed. There is no good way of saying how much capital one possesses except bv stating it in terms of money. If any business man were to state how much capital he used in his business, he would be reduced to the necessity of saying so many dollars or so many dollars' worth. However, he is not likely to labor under the delusion that capital is money. If he were to state in what his capital consists, he would not, unless he were a money lender pure and simple, say that it consisted of money. He would give an inventory of his productive property, or of the property which he used in his business.

Others who reject the idea that capital is money still hold to the idea that it is a fund of value. The distinction is made between capital and capital goods, capital being the fund of value and capital goods being the goods in which that fund is embodied. No great harm can come from this use of words so long as they are properly understood, but they are not strictly accurate and may lead to confusion. The value of the goods is not capital, the goods are capital. Value is the important quality which they all possess in common, and, therefore, it is the only quality in terms of which their quantity can be stated. Money is the commodity used in measuring that quantity. See VALUE.

The function of productive capital is to aid in production. Except in the case of money, its value is not an aid in production, it is only a symptom of the aid which it is anticipated that it will render in production. In this respect the value of a piece of land resembles the value of a piece of capital. It is not its value which makes the land productive; it is its productivity or its usefulness in production which gives it its value. Similarly it is the productivity of any piece of capital, or its usefulness in production, which gives it its value. In the case of that special kind of capital known as money, and in this case alone, its productivity, or its ability to aid in production, depends upon its value or its purchasing power. In all the other cases, it is the various tools, machines, buildings and other bits of equipment which perform the function of aiding in production. They derive their value from the fact that they perform that function. It is not the value which performs the function.

Capital is the combined result of labor performed in the making of the things which constitute it, and of the waiting which is necessary to the performance of work long in advance of the maturing of a consumable product. The labor and the waiting may both be performed by the same person, or by different persons. They are performed by the same person when a man, say a farmer, makes his own plow, and then waits during the lifetime of the plow for the benefits in the form of income or the products of the plow. They are performed by different men when the farmer buys the plow from a blacksmith, paying him cash. The blacksmith performed the labor of making it, but does not have to wait for its benefits, since he is already paid for his work. The farmer does the waiting, having surrendered present cash long before he receives the benefits in the form of larger crops year after year, from its possession. At the present time, in our highly complicated industrial system, with its increase of specialization, the working and the waiting are generally performed by different persons. Even the case of the plow made by a blacksmith and sold to a farmer, while a real case, is exceedingly simple as compared with the average process of capitalistic accumulation. A modern plow factory is using machinery and equipment, that is, capital, which was made in other factories, and these, in turn, are using other capital made in still other factories, and so on back to the mines, and there machinery is used which also can be traced back to other factories and other mines. But in all this complex system, those who labor will generally be paid wages as they go along, while others will do the investing, which means that they must spend considerable money in advance and get it back with an increase over a period of years. Thus the two functions of the laborer and the capitalist, or of labor and capital as they are sometimes called, are pretty sharply separated.

Capital has existed, of course, as long as tools and equipment have existed, but this separation of the two functions has become general only since the rise of machine production. Before that time, the function of the capitalist was not important enough to create an opportunity for many men. Not enough capital was needed in the more primitive forms of industry which preceded the present to enable any large number of men to live on its earnings. It is this fact which is probably meant when it is erroneously stated that capital in the modern sense came into existence with the rise of the factory system. Capital in the modern sense does not differ, except in its greater quantity and in the greater opportunity it gives to the capitalist, from capital in any other sense. See INCOME; NATIONAL WEALTH.

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CAPITAL, *in architecture,* the uppermost member of a column, that is to say, a separate piece of stone set upon the shaft and supporting an epistyle or the abutment of an arch — in short the mass of the building which is imposed upon the column.

A column must always have a shaft and a capital; without these features it would be a post, perhaps a pillar or a pier, but would have no architectural character. The capital, moreover, has generally received the most elaborate decorative treatment of the whole composition. Thus in Egypt while the shaft might be cylindrical or conical, the capital would spread out immediately in curves either concave or convex, and would be carved and painted. It is even practicable to divide Egyptian columns into four orders by their capitals, which spread in different ways, and are ornamented by different sculpture more or less imitative of nature. The idea of the spread given to the capital is, of course, that in this way the superstructure is taken more easily, as it is always and of necessity much larger horizontally than the column itself.

The stone uprights left in rock-cut temples in India and called ordinarily pillars, because of their varied forms — octagonal, square and the like — are still divided into shaft and capital, though the forms of these are entirely remote from Egyptian or later European examples. Thus, some capitals consist of a mere enrichment of the uppermost band of the shaft and a superincumbent block very elaborately carved. In some cases this upper block gives off corbels and consoles which help to carry the roof by their greater spread.

The capitals which have excited the most interest among European students of art are those of the three Greek orders and of the five Renaissance orders which were deduced from the first three. The capital of the Grecian Doric is a reversal cone rounded off at top and carrying a square plinth or die; this plain *echinus* was richly painted in bright colors. The capital of the Ionic order is a curious device consisting of scrolls or volutes, two on each of the two opposite sides, so that this capital, almost alone, has not the same appearance from every point of view. The capital of the Corinthian order is a circular bell, surrounded by acanthus leaves and having at each corner a couple of projecting scrolls not unlike those of the Ionic order but small. This Corinthian order received many modifications in ancient Roman practice, and one of these was erected by the Renaissance men into a separate order, the so-called Composite. From the Grecian Doric the Roman Doric took shape, and this was used by the Renaissance men, while a still simpler order was made from it and called the Tuscan. The capitals of these two orders are very thin and low in vertical measurement, and consist of moldings running round the continuation of the shaft, and either plain or slightly carved into the simplest of the egg and dart moldings or the like.

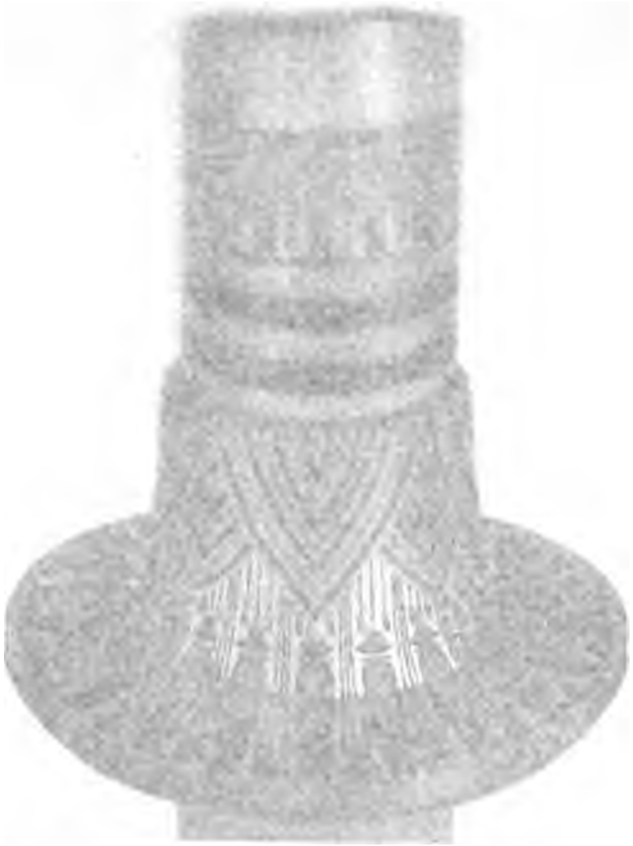
In mediæval architecture, both Romanesque and Gothic, the capitals are almost infinitely varied. The strong tendency of the time toward elaborate carving made this block of stone, from 5 to 20 feet above the aisles and in a prominent place, a most tempting vehicle for sculpture, and the abandonment of the classical orders left every artist free to design his own system of leafage, animal forms and the like. In this way mediæval capitals are often of extraordinary beauty; but no attempt has been made to classify them except as they form part of a style. See COLUMN.

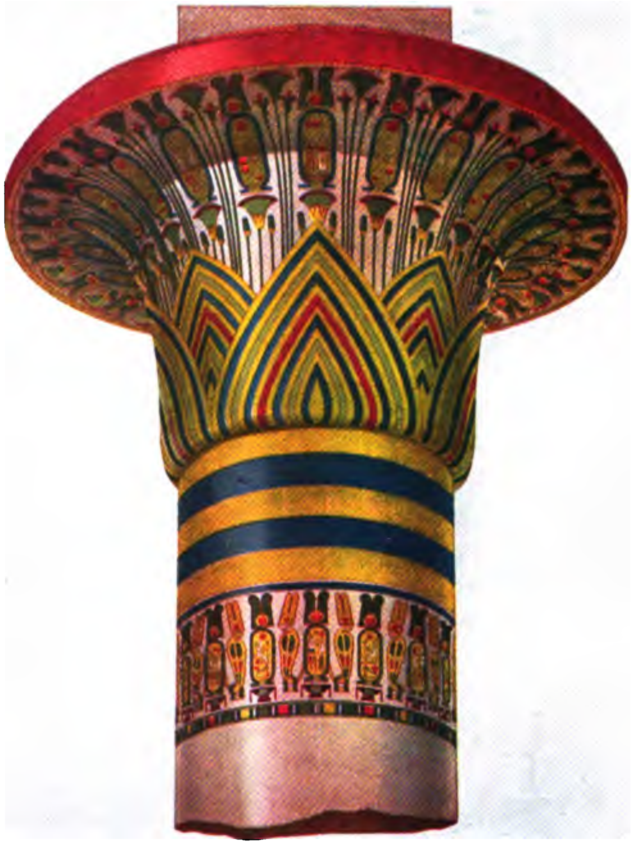
RUSSELL STURGIS.

CAPITAL (Das Kapital), a noted work by Karl Marx, published in 1867; English translation edited by Fred Engels, 1887; a book of the first importance, by the founder of international socialism. The conservative aspect of Marx's teaching is in the fact that he honestly seeks to understand what, apart from any man's opinion or theory, the historical development actually is; and that he does not think out and urge his own ideal program of social reform, but strives to understand and to make understood what must inevitably take place.

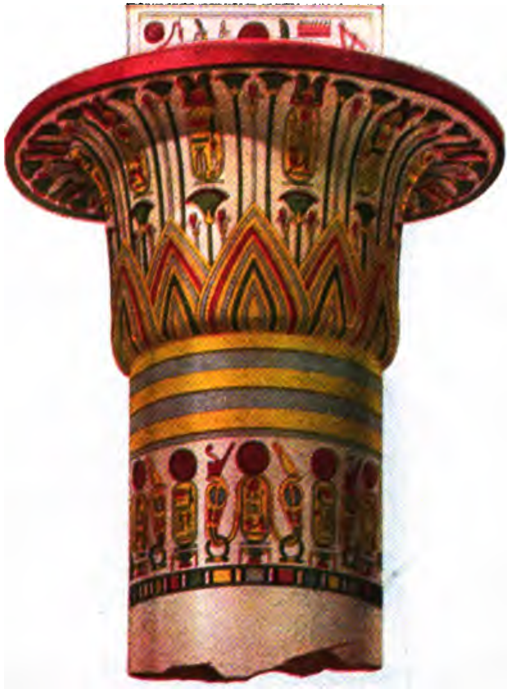
CAPITAL PUNISHMENT (Latin *caput,* «the head»; hence *capitalis,* «pertaining to or affecting the head»; hence «affecting the life»), the punishment of death. The questions most commonly discussed by philosophers and jurists under this head are: (1) As to the right of governments to inflict the punishment of death; (2) as to the expediency of such punishment; (3) as to the crimes to which, if any, it may be most properly confined and limited; (4) as to the manner in which it should be inflicted.

1. As to the right of inflicting the punishment of death. This has been doubted by some distinguished persons and the doubt is often the accompaniment of a highly cultivated mind, inclined to the indulgence of a romantic sensibility, and believing in human perfectibility. One of the first men of prominence to advocate the abolition of capital punishment was Robespierre, the French revolutionist, who not only wrote many pamphlets against it, but resigned his position as criminal judge of Arras, to avoid pronouncing a death sentence. The right of society to punish offenses against its safety and good order will scarcely be doubted by any considerate person. In a state of nature individuals have a right to guard themselves from injury, and to repel all aggressions by a force or precaution adequate to the object. This results from the right of self-preservation. If a person attempts to take away my life, I have, doubtless, a right to protect myself against the attempt by all reasonable means. If I cannot secure myself but by taking the life of the assailant, I have a right to take it. It would otherwise follow that I must submit to a wrong, and lose my life rather than

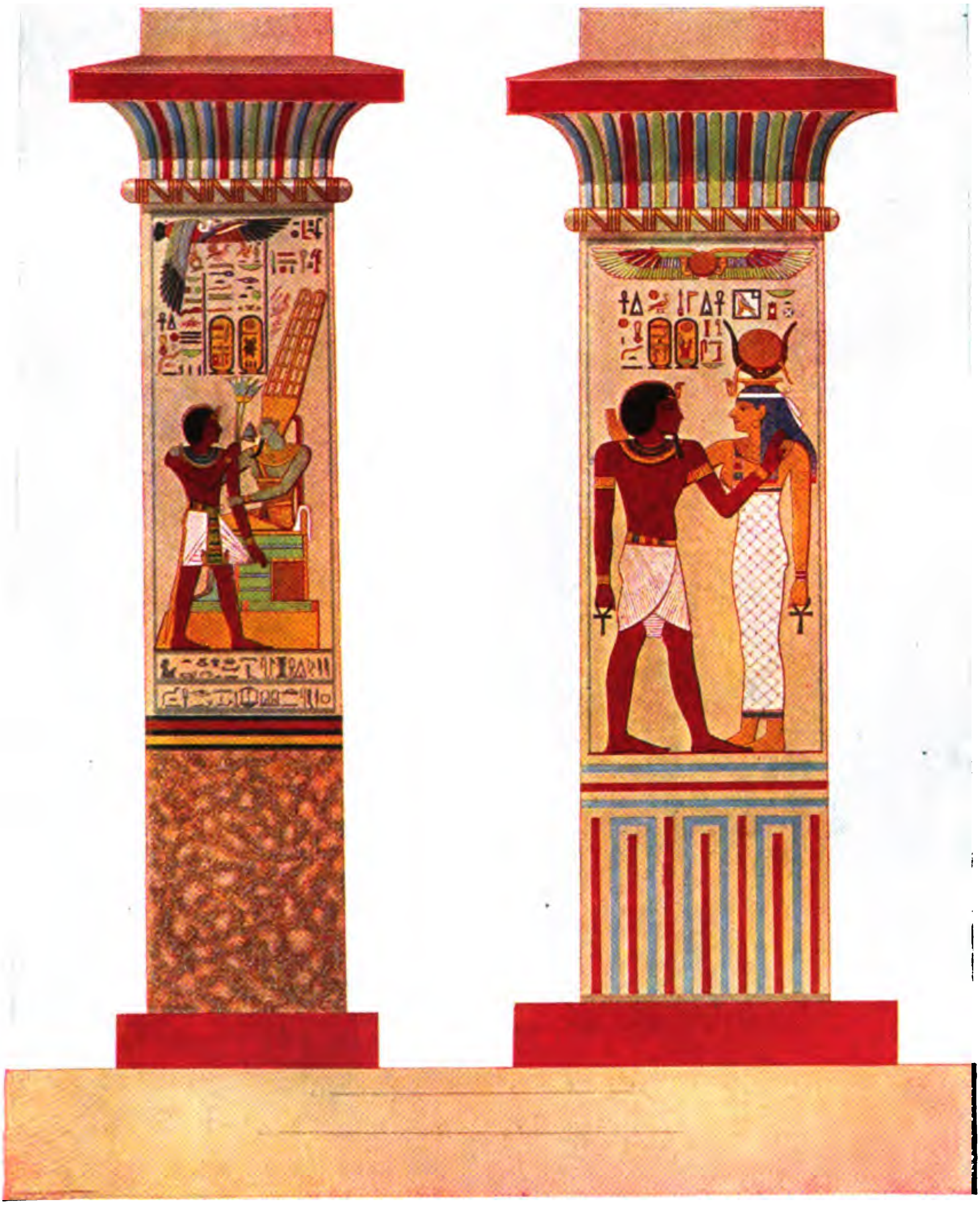




BELL-SHAPED CAPITAL FROM THE HYPOSTYLE HALL
KARNAK, EGYPT



BELL-SHAPED CAPITAL FROM THE RAMESEUM
THEBES, EGYPT



PIERS WITH CAPITALS

preserve it by the means adequate to maintain it. It cannot, then, be denied, that in a state of nature men may repel force by force, and may even justly take away life, if necessary, to preserve their own. When men enter society, the right to protect themselves from injury and to redress wrongs is transferred generally from the individuals to the community. We say that it is generally so, because it must be obvious that in many cases the natural right of self-defense must remain. If a robber attacks one on the highway, or attempts to murder him, it is clear that he has a right to repel the assault, and to take the life of the assailant if necessary for his safety, since society in such a case could not afford him any adequate and prompt protection. The necessity of instant relief, and of instant application of force, justifies the act, and is recognized in all civilized communities. When the right of society is once admitted to punish for offenses, it seems difficult to assign any limits to the exercise of that right, short of what the exigencies of society require. If a state has a right to protect itself and its citizens in the enjoyment of its privileges and its peace, it must have a right to apply means adequate to this object. The object of human punishments is, or may be, threefold: (1) To reform the offender (2) to deter others from offending; and (3) to secure the safety of the community, by depriving the offender of the power of doing mischief. The first consideration has only lately entered into human legislation, because of the inadequacy of our means to produce great moral results by the infliction of punishment. The two latter considerations enter largely into the theory and practice of legislation. Who is to be the judge in such cases? what is the adequate punishment for any offense? Certainly punishments ought not to be inflicted which are utterly disproportionate to the offense, and beyond the exigencies of society. No government has a right to punish cruelly and wantonly and from mere revenge; but still, the discretion must be vested somewhere, to say what shall be the degree of punishment to be assigned to a particular offense. That discretion must be, from its nature, justly a part of the legislative power, and to be exercised according to the actual state of society. It may,—nay, it must,—be differently exercised in different ages and in different countries; for the same punishment which in one age or country may be sufficient to suppress an offense, or render it comparatively harmless, may, in another age or country, wholly fail of the effect. If mild punishments fail of effect, more severe ones must be resorted to if the offense be of a nature which affects society in its vital principles, or safety, or interests. The very frequency of a crime must often furnish a very strong ground for severe punishment, not only as it furnishes proof that the present punishment is insufficient to deter men from committing it, but from the increased necessity of protecting society against dangerous crimes. But it is often said that life is the gift of God, and therefore it cannot justly be taken away, either by the party himself or another. If he cannot take it away, he cannot confer that power on others. But the fallacy of this argument is obvious. Life is no more the gift of God than other personal endowments or rights. A man has, by the gift of God, a right to personal liberty and locomotion, as well as to life; to eat and drink and breathe at large, as well as to exist, yet no one doubts that, by way of punishment, he may be confined in a solitary cell; that he may be perpetually imprisoned or deprived of free air, or compelled to live on bread and water. In short, no one doubts that he may be restrained in the exercise of any privileges or natural rights short of taking his life. Yet the reasoning, if worth anything, extends to all these cases in an equal degree. If, by his crimes, a man may justly forfeit his personal rights, why not his life? But we have seen that it is not true, even in a state of nature, that a man's life may not be taken away by another if the necessity of the case requires it. Why, then, may not society do the same if its own safety requires it? Is the safety of one person more important than the safety of the whole community? Then, again as to a man's inability to confer on others a right which he does not himself possess. Suppose it is so; the consequence which is deduced from this does not, in fact, arise. Blackstone, indeed, seems to deduce the right of society to punish capital offenses in certain cases (that is, in cases of *mala prohibita* and not *mala in se*) from the consent of the offenders. The Marquis Beccaria, on the other hand, denies that any such consent can confer the right, and therefore objects to its existence. But the notion of consent is, in nearly all cases, a mere theory, having no foundation in fact. If a foreigner comes into a country and commits a crime at his first entrance, it is a very forced construction to say that he consents to be bound by its laws. If a pirate commits piracy, it is absurd to say that he consents to the right of all nations to punish him for it. The true and rational ground on which the right rests is not the consent of the offender, but the right of every society to protect its own peace, interests, property and institutions, and the utter want of any right in other persons to disturb or destroy or subtract them. The right flows, not from consent, but from the legitimate institution of society. If men have a right to form a society for mutual benefit and security they have a right to punish other persons who would overthrow it. There are many cases where a state authorizes life to be taken away, the lawfulness of which is not doubted. No reasonable man doubts the right of a nation, in a just war, especially of self-defense, to repel force by force and to take away the lives of its enemies. And the right is not confined to repelling present force, but it extends to precautionary measures which are necessary for the ultimate safety of the nation. In such a war a nation may justly insist upon the sacrifice of the lives of its own citizens, however innocent, for the purpose of ensuring its own safety. Accordingly we find that all nations enroll militia and employ troops for war, and require them to hazard their lives for the preservation of the state. In these cases life is freely sacrificed by the nation; and the laws enacted for such purposes are deemed just exercises of power. If so, why may not life be taken away by way of punishment if the safety of society requires it? If a nation may authorize, in war, the destruction of thousands, why may it not authorize the destruction of a single life, if self-preservation requires it?

The mistake, however, is in supposing that life cannot be taken away without the consent of the party. If the foregoing reasoning be correct, such consent is neither supposed nor necessary. In truth, the supposition of an original compact between all the persons who are subject to the regulations of a society, by their own free consent, as the necessary and proper basis on which all the rights of such society depend, is at best a gratuitous supposition, and it sometimes leads to very incorrect results. It may be added that the Scriptures most clearly recognize and justify the infliction of capital punishments in certain cases.

2. As to the expediency of capital punishment. This opens a wide field for discussion. Some able men who do not doubt the right do still deny the expediency of inflicting it. It may be admitted that a wise legislature ought to be slow in affixing such a punishment to any but very enormous and dangerous crimes. The frequency of a crime is not of itself a sufficient reason for resorting to such a punishment. It should be a crime of great atrocity and danger to society, and one which cannot otherwise be effectually guarded against. In affixing punishments to any offense, we should consider what are the objects and ends of punishment. It is clear that capital punishment can have no effect in reforming the offender himself. It may have, and ordinarily does have, the effect of deterring others from committing a like offense; but still, human experience shows that even this punishment, when inflicted for small offenses, which are easily perpetrated, and to which there is great temptation, does not always operate as an effectual terror. Men are sometimes hardened by the frequent spectacles of capital punishments and grow indifferent to them. Familiarity deprives them of their horror. The bloodiest codes are not those which have most effectually suppressed offenses. Besides, public opinion has great weight in producing the acquittal or condemnation of offenders. If a punishment be grossly disproportionate to the offense, if it shock human feelings, there arises, insensibly, a sympathy for the victim and a desire to screen him from punishment; so that, as far as certainty of punishment operates to deter from crimes, the object of the legislature is often thus defeated. It may be added that a reasonable doubt may fairly be entertained whether any society can lawfully exercise the power of punishing beyond what the just exigencies of that society require. On the other hand, a total abolition of capital punishments would, in some cases at least, expose society to the risk of deep and vital injuries. A man who has committed murder deliberately has proved himself unfit for society and regardless of all the duties which belong to it. The safety of society is most effectually guarded by cutting him off from the power of doing further mischief. If his life be not taken away, the only other means left are confinement for life or transportation and exile for life. Neither of these is a perfect security against the commission of other crimes, and may not always be within the power of a nation without great inconvenience and great expense to itself. It is true that the latter punishments leave open the chance of reform to the offender, which is indeed but too often a mere delusion; but, on the other hand, they greatly diminish the influence of another salutary principle, the deterring of others from committing like crimes. It seems to us therefore that it is difficult to maintain the proposition that capital punishments are at all times and under all considerations inexpedient. It may rather be affirmed that in some cases they are absolutely indispensable to the safety and good order of society. Some states have, however, entirely abolished capital punishment, as is the case in Holland, Rumania, Portugal, a certain number of the Swiss cantons, and some States of the American Union, including Michigan, Wisconsin, Maine, Rhode Island and Kansas. It was entirely abolished in Switzerland in 1874, but a few years after, owing to the increase of murders, it was again made permissible. It was also for a time done away with in Austria and in one or two of the States of this country, while in Russia it was abolished in 1750, only to be revived for political offenses when the Revolutionary agitators became numerous. It was again abolished in 1917 by the Revolutionary government.

3. As to the crimes to which capital punishments may most properly be limited. From what has been already said it is plain that this must depend upon the particular circumstances of every age and nation; and much must be left to the exercise of a sound discretion on the part of the legislature. As a general rule humanity forbids such punishments to be applied to any but crimes of very great enormity and danger to individuals or the state. If any crimes can be effectually suppressed by moderate means, these ought certainly to be first resorted to. The experience, however, of most nations, if we may judge from the nature and extent of their criminal legislation, seems to disprove the opinion so often indulged by philanthropists that capital punishments are wholly unnecessary. The codes of most civilized nations used to abound with capital punishments. That of Great Britain long continued to be very sanguinary. Blackstone, in his 'Commentaries,' admits that in his time not less than 160 crimes were, by the English law, punishable with death. Forgery was one of these up to the reign of William IV. The only crimes for which capital punishment may now be inflicted, according to the law of England, are high treason and murder. The law in Scotland is substantially the same, a sentence of capital punishment now being competent only in cases of treason, murder and attempts to murder in certain cases. By United States statutes nine crimes are so punishable, including treason, murder, arson, rape, piracy and robbery of the mail. In several States of the Union still fewer crimes are generally punishable with death. Beyond treason, murder, arson, piracy, highway robbery, burglary, rape and some other offenses of great enormity and of a kindred character, it is extremely questionable whether there can be necessity or expediency in applying so great a severity. Beccaria, with his characteristic humanity and sagacity, has strongly urged that the certainty of punishment is more important to deter from crimes than the severity of it.

4. As to the manner of inflicting the punishment of death. This has been different in different countries, and in different stages of civilization in the same countries. Barbarous nations are generally inclined to severe and

vindictive punishments; and, where they punish with death, to aggravate it by prolonging the sufferings of the victim with ingenious devices in cruelty. And even in civilized countries, in cases of a political nature or of very great atrocity, the punishment has been sometimes inflicted with many horrible accompaniments. Tearing the criminal to pieces, piercing his breast with a pointed pole; pinching to death with red-hot pincers; starving to death; breaking his limbs upon the wheel; pressing to death in a slow and lingering manner; burning at the stake; crucifixion; sawing to pieces; quartering alive; exposure to wild beasts; and other savage punishments, have been sometimes resorted to for the purposes of vengeance, public example or public terror. Compared with these the infliction of death by drowning, strangling, poisoning, bleeding, beheading, shooting or hanging is a moderate punishment. In modern times public opinion is strongly disposed to discountenance the punishment of death by any but simple means; and the infliction of torture is almost universally reprobated. Even in governments where it is still countenanced by the laws it is rarely resorted to; and the sentence is remitted, by the policy of the government, beyond the simple infliction of death. In Prussia, where atrocious criminals were required by the penal code to be broken upon the wheel, the King latterly used always to issue an order to the executioner to strangle the criminal (which was done by a small cord not easily seen) before his limbs were broken. So in the same country, where robbery attended with destruction of life was punished by burning alive, the faggots were so arranged as to form a kind of cell in which the criminal was suffocated by the fumes of sulphur, or other means, before the flame could reach him. Not only is torture now abolished by civilized nations, but even the infliction of capital punishment in public has been given up by most of them. In England, in high treason, the criminal is sentenced to be drawn to the gallows, to be hanged by the neck until he be dead, to have his head cut off, and his body divided into four parts, and these to be at the disposal of the Crown. But, generally, all the punishment is remitted by the Crown, except the hanging and beheading, and these too may be altogether remitted according to circumstances. In other cases the punishment is now simply by hanging, or, in the military and naval service, by shooting. In France formerly the punishment of death was often inflicted by breaking the criminal on the wheel. The usual punishment now is beheading by the guillotine. In 1853 a kind of guillotine (*Fallschwert*) was introduced into the kingdom of Saxony, and it has since been adopted as the means of execution in several other German states. In Austria the general mode of punishment is by hanging. In Prussia hanging is rarely inflicted; but the usual punishment is beheading with a heavy axe, the criminal's head being first tied to a block. In one or two German states execution by the sword still exists. It should be remarked, however, that in Germany hanging has always been deemed the most infamous sort of punishment; and the sentence has often been commuted for beheading by the sword as a milder or less dishonorable mode of punishment. In the United States of America hanging is the almost universal mode of capital punishment, though electrocution has been adopted in New York and Massachusetts, and several other States. The Constitution of the United States contains a provision against "cruel and unusual punishments." In China decapitation by the sword is the usual form: murderers are cut to pieces; robbers not. In Russia the punishment of death was until 1917 frequently inflicted by the knout. In Turkey strangling and sewing the criminal up in a bag, and throwing him into the sea, are common modes of punishment. In the Roman code many severe and cruel punishments were prescribed. During the favored times of the republic many of these were abolished or mitigated. But again, under the emperors, they were revived with full severity. In the ancient Grecian states the modes of punishment were also severe and often cruel. The ancient Greek mode of capital punishment by taking poison at such hour as the condemned party should choose, seems never to have been in use among any Christian people.

Whether execution ought to be public or private has been a question much discussed, and one upon which a great diversity of opinion exists among intelligent statesmen. On the one hand, it is said that public spectacles of this sort have a tendency to brutalize and harden the people, or to make them indifferent to the punishment; and the courage and firmness with which the criminal often meets death have a tendency to awaken feelings of sympathy, and even of admiration, and to take away much of the horror of the offense as well as of the punishment. On the other hand it is said that the great influence of punishment in deterring others from the like offense cannot be obtained in any other way. It is the only means to bring home to the mass of the people a salutary dread and warning; and it is a public admonition of the certainty of punishment following upon crime. It is also added that all punishments ought to be subjected to the public scrutiny, so that it may be known that all the law requires, and no more, has been done. Since 1868 the law of the United Kingdom has required all executions to take place privately within the prison walls, and this system seems to have given general satisfaction. The same method is also practised in various other countries. In 1870 a similar measure was proposed in the French Assembly, but the war prevented it being passed and it is not yet law.

In England, the court before which the trial is held declares the sentence and directs the execution of it. In the courts of the United States there is a like authority; but in the laws of many of the States there is a provision that the execution shall not take place except by a warrant from the governor, or other executive authority. In cases of murder and other atrocious crimes the punishment in England is usually inflicted at a very short interval after the sentence. In America there is usually allowed a very considerable interval, varying from one month to six months. In Great Britain appeal is allowed, on a point of law, and on a question of fact, if the judge certifies the case as fit for appeal, or the Court of Criminal Appeal grants leave to appeal. On conviction the judge can reserve a question of law, but not of fact, for the Court of Criminal Appeal, which can reverse or affirm the judgment. The only other method of securing a revision of a sentence is by the Royal Prerogative, exercised on the advice of the Home Secretary. In the United States there is considerable latitude of appeal. In France there may be a review in the Court of Cassation. In Germany there is, in criminal as in civil cases, a right of appeal; hence, in that country, few innocent persons have suffered capitally since the 16th century. Capital punishment cannot be inflicted, by the general humanity of the laws of modern nations, upon persons who are insane or who are pregnant, until the latter are delivered and the former become sane. It is said that Frederick the Great required all judgments of his courts condemning persons to death to be written on blue paper; thus he was constantly reminded of them as they lay on his table among other papers, from which they were readily distinguished. He usually took a long time to consider such cases, and thus set an excellent example to sovereigns of their duty. Consult Curtis, N. M., 'Capital Crimes' (New York 1894); Actes du 8me Congrès pénitentiaire international (1910).

CAPITALS (*majuscula*), the large letters used in writing and printing, most commonly as the initial letters of certain words, or of all words in certain positions, and distinguished from the small letters (*minuscula*). As among the ancient Greeks and Romans, so also in the early part of the Middle Ages, all books were written without any distinction in the kind of letters used; but gradually the practice became common of beginning a book, subsequently, also, the chief divisions and sections of a book, with a large capital letter, usually illuminated and otherwise richly ornamented. In legal or state documents of the 13th century capital letters are found dispersed over the text as the initial letters of proper names, and of the names of the Deity, and in the next century the same usage was followed in ordinary manuscripts. The practice with regard to the use of capitals varies in different countries. Sentences and proper names begin almost universally with capitals, but there are several other cases in which the usage is not so general. In English there cannot be said to be any invariable rule regulating their use. The first personal pronoun is always written and printed with a capital letter, and it is common also to begin titles and the names of well-known public bodies, societies, institutions, etc., with capitals. Formerly, it was a frequent practice to begin all substantives in English with a capital, which is still the rule in German. The Germans also begin all titles and pronouns of address with capitals, but not the first personal pronoun. One point in which the English practice differs from that of Germany, France, Italy and other continental countries, is in beginning adjectives derived from proper names, such as Spanish, Italian, etc., like proper names themselves, with capitals, such adjectives being printed in other countries entirely with small letters. See Alphabet; Writing, and consult Pron, 'Manuel de paléographie latine' (3d ed., Paris 1910); Thompson, E. M., 'Greek and Latin Palæography' (Oxford 1912).

CAPITANIS, kăp-ĭ-tä'nēs. See Armatoles.

CAPITATION is applied to anything that concerns a number of persons individually. Thus a capitation tax is a tax imposed upon all the members of a state, each of whom has to pay his share, and is distinguished from taxes upon merchandise, etc. A capitation-grant is a grant given to a number of persons, a certain amount being allowed for every individual among the number. Class capitation taxes, when differentiated according to fortune, become income taxes. In France of pre-revolutionary days graduated capitation taxes were levied and were intended to reach all classes. The privileged classes, however, succeeded by various means in evading either wholly or in part these taxes and the unequal burden thus thrown on the great unprivileged class was one of the fundamental causes of the Revolution.

CAPITO, cä'pē-tō, or **KOPFEL, Wolfgang Fabricius**, Alsatian reformer: b. Hagenau 1478; d. Strassburg, November 1541. Entering the Benedictine order, he became professor of theology at Basel, where he showed in his lectures a tendency to shake off the trammels of the scholastic writers. In 1523 he was made provost of Saint Thomas, Strassburg. He approved of Luther's action, but nevertheless in 1519 entered the service of Albert of Mainz; and it was not till some years later that he finally declared for the Reformation. He then entered zealously into its work, shared with Bucer the composition of the Confessio Tetrapolitana, and took part in the Synod of Bern in 1532. His earnest work for Christian unity caused him to be viewed with suspicion by the narrower-minded among the Reformers. Consult Baum, 'Capito und Bucer' (Elberfeld 1860).

CAPITOL, now *Campidoglio*, the citadel of ancient Rome, standing on the Capitoline Hill, the smallest of the seven hills of Rome, anciently called the Saturnine and the Tarpeian Rock. It was planned and said to have been begun by Tarquinius Priscus, but not completed till after the expulsion of the kings. At the time of the civil commotions under Sulla it was burned down, and rebuilt by the Senate. It again suffered the same fate twice, and was restored by Vespasian and Domitian. The latter caused it to be built with great splendor, and instituted there the Capitoline games. Dionysius says the temple, with the exterior pillars, was 200 feet long and 185 broad. The whole building consisted of three temples, which were dedicated to Jupiter, Juno and Minerva, and separated from one another by walls. In the wide portico triumphal banquets were given to the people. The statue of Jupiter, in the capitol, represented him sitting on a throne of ivory and gold, and consisted in the earliest times of clay painted red. Under Trajan, it was formed of gold. The roof of the temple was made of bronze; it was gilded by Quintus Catulus. The doors were of the same metal. Splendor and expense were lavished upon the whole edifice. On the pediment stood a chariot, drawn by four horses, at first of clay, and afterward of gilded brass. The temple itself contained an immense quantity of the most magnificent presents. The most important papers were preserved in it. The Capitoline Hill consists of three parts, namely, the northern summit, now occupied by the church of Santa Maria in Aracœli; the southern summit, crowned by the Palazzo Caffarelli, usually occupied by the German ambassador; and the depression between these, in which is now the Piazza del Campidoglio. The above church, which is approached from the northwest by a lofty flight of steps, is of great antiquity. In 1888 the Franciscan monastery which was connected with it was replaced by a large monument of Victor Emmanuel II. The Piazza del Campidoglio was designed by Michelangelo. In its centre is a fine equestrian bronze statue of Marcus Aurelius. On the southeast side there is the Palazzo del Senatore, with a fine flight of steps erected by Michelangelo. The Palace of the Conservatori occupies the southwest side of the square, and contains valuable collections in art and antiquities. Directly opposite is the Capitoline Museum, founded by Innocent X. The southern summit of the hill is now called Monte Caprino, and on it, beside the Palazzo Caffarelli already mentioned, stands a hospital and a German archæological institute. (See ROME). Consult Platner,'Topography and Monuments of Ancient Rome,' pp. 291–308, New York 1911. Besides the edifice in Washington where Congress assembles, the statehouses in States of the Union are officially called capitols. Of these the most noteworthy are those at Albany, Hartford, Providence, Austin, Jefferson City and Saint Paul.

CAPITOL AT WASHINGTON, The. After the national capital had been located on the Potomac in 1789, Washington and Maj. P. C. L'Enfant selected sites for the public buildings. On the first map (1791), the "Congress House" is situated as now, on a low hill commanding the best view in Washington, with 12 broad streets radiating from it, so that it closes the vista of every main avenue. On the decision of a board of three commissioners, with Washington and Jefferson, the plans of the capitol and the President's house were given out in 1792 to public competition, for a prize of $500 or a medal of that value, at the winner's option. For the President's house James Hoban's plans were accepted at once, and he was made superintendent of its erection. For the capitol none were satisfactory, but the three foremost competitors were given another trial, and one, Stephen Hallet, a French artist living in Philadelphia, was employed at a salary and indemnity to revise his plans under the commissioners' criticism. But later in the year Dr. William Thornton of Tortola Island, W. I., submitted plans whose "grandeur, simplicity, beauty and convenience" forced the committee to accept them. They were too grand for the commissioners' ideas of national needs or resources at the time, however, and specified too costly materials. Thornton wished marble and mahogany and the best of construction, and under a bitter assault from several of his rejected competitors, headed by Hallet, whom the commissioners had joined with Thornton in a revising board, he was forced to reduce its scale and material greatly. Their suggested modifications of his general plan were, however, disapproved. These plans were for what is now the central portion of the capitol.

Work was begun about 1 August. The corner-stone was laid 18 September in the southeast corner of the old north wing, now the Supreme Court section, with imposing ceremonies, Masonic rites and procession, and a barbecue. Hoban was made superintendent, and Hallet his assistant; but Hoban gave his whole time to the White House, as the President's house came to be called, and Hallet was the real manager. He proceeded to change Thornton's plans and specifications at will, was repeatedly censured for it and at last ordered to stop it. He resigned, but refused to give up the drawings; the commissioners at last secured them and discharged him, 15 Nov. 1794. Thornton, now one of the commissioners of the District of Columbia, was asked by Washington to obliterate Hallet's changes as injurious, and did so. Hoban now acted as superintendent until George Hadfield, an English architect, was engaged to succeed Hallet, on Jonathan Trumbull's recommendation of him as a modest man and good artist. He outdid Hallet; spent his whole energy in fighting Thornton and Hoban (who always worked in harmony), and after repeated resignations and reconsiderations, was discharged for practical incompetence 10 May 1798. Hoban again took charge. On 17 Nov. 1800 the second session of the sixth Congress met in the north wing of the building. Much of this early construction was of wood or poor material. This was on account of haste, the local interests being very urgent for the coming of the government to that seat. A few years later more durable material was substituted. The commissionership was abolished May 1802, and Thornton and Hoban ceased direct superintendence, though often called in consultation. At this time the north wing was complete, the foundation of the central rotunda and dome in place and the basement story of the south wing partly done. These are still as Thornton planned them.

On 6 March 1803 Jefferson appointed Benjamin H. Latrobe (q.v.) "surveyor of public buildings." He at once began, like the others, to besiege the President with the bitterest assaults on Thornton's designs, and when the former declined to interfere, appealed to Congress. Thornton, however, now in charge of the patent office, though he defended himself with energy, made no further attempt to prevent the alteration of his plans, and Latrobe made many serious changes, some of them since judged harmful to beauty and utility. Thus, the Representatives' hall was changed from a graceful ellipse to a square with semi-circular ends; a bad echo gave trouble for many years, caused by the changes. The number and size of entrances to the rotunda were curtailed, the splendid open staircases, cut down and placed in obscurity, were difficult for strangers to find; and the grand semi-circular western portico was abolished. The principal entrance was also changed from the west front, facing the White House, to the eastern side. Latrobe was constantly in hot water with both Jefferson and Congress, and published a pamphlet against them in 1806; but till 1811 had pretty much his own way. When the War of 1812 broke out, the capitol consisted of the north and south wings, connected by a corridor of rough boards over the central foundations. On 24 Aug. 1814 the British burnt it as far as possible, piling the furniture and platforms in the rooms with rocket stuff and igniting them; the interior was dreadfully damaged, but the outside walls remained, also the inside brickwork and some stone. A strong movement arose for removing the capital elsewhere; but the same considerations prevailed against it as later. In fear of such a result, however, the local interests formed the "Capitol Hotel Company," and erected a building for government occupancy till the repairs on the capitol were finished. It was occupied, 1815–19, and was afterward known as the "Old Capitol," and used in the Civil War as a military prison. In the reconstruction the House wing was entirely altered.

Near the end of 1817 Latrobe became embroiled with a new commissioner of the Federal building, Samuel Lane, and resigned. In his place was appointed Charles Bulfinch (q.v.), from 1 Jan. 1818; he remained supervising architect for the next decade. In the winter of 1819–20 Congress took its seat in the new hall. The centre was pushed forward to completion, and on 10 Dec. 1824, the entire interior was finished. In 1825 a public competition was held for the figures on the pediment of the eastern portico. From 1826 on, Bulfinch was employed on special detail, and the landscape gardening and work on the grounds, which were of his designing. The capitol was set in a park of 22½ acres, encircled by an iron railing somewhat taller than a man, affixed in the sandstone coping of a low wall. There were four carriage and five pedestrian entrances. On 2 March 1828 the position of architect of the capitol was abolished; but Bulfinch remained in employment till the end of June 1829, when Jackson dismissed him. He designed and planned the modern form of the then west extremity of the building, the Senate galleries and the terraces on the east; and made the dome higher than in Thornton's plan. Among others who should have great credit for the beauty of the capitol are Peter Lenox, clerk of works under Latrobe; George Blagden, superintendent of stonecutters; and Giovanni Andrei, an Italian, superintendent of carvers. That so beautiful and harmonious a structure should have emerged from the contentions of so many different minds is due partly to the really great ability of the three chief architects, Thornton, Latrobe and Bulfinch, and partly to the determination of successive Presidents that the changes should harmonize with the original design. Latrobe's material external alterations of Thornton's plan have been mentioned; Bulfinch designed the western central portico as it now stands.

From 1829 to 1836 there was no architect of the capitol. On 6 June 1836, Jackson appointed as Federal architect Robert Mills (q.v.), who had studied under Latrobe; and he held the place till 1851. Thomas U. Walter (q.v.) then took the post, having drawn the plans for the two modern wings that extended the original capitol, which the government needs had outgrown, into the modern one. The corner-stone of the extension was laid by President Fillmore, 4 July 1851; the new Representatives' hall was occupied in 1857; the Senate hall in 1859. The great lengthening of the dimensions required a correspondent heightening of the dome; and Mr. Walter designed a new one, which was constructed during the Civil War, and completed at the close of 1863, the statue of Freedom being then lifted into place. Mr. Walter, however, had foreseen a future need of still further extension, and had drawn plans for it while the other work was going on. Congress in the spring of 1903 authorized their execution, at an expenditure of $2,500,000 and three years' time, under the supervision of the Federal architect, Mr. Woods. As now completed the capitol cost over $16,000,000. It covers an area of about four acres standing amid beautiful park grounds of nearly 50 acres, adorned with fountains and classic statuary. The building is 750 feet long, from 121 to 140 feet deep and rises to a total height of 285½ feet from the base of the capitol to the top of the final figure of Freedom, 19½ feet high, on the dome. Massive cast bronze doors, depicting events famous in the nation's history, grace the three main entrances on the east front — to the Rotunda, the Senate and the House. In the Rotunda under the dome are many priceless historical paintings, and in Statuary Hall is an assemblage of portrait statues, gifts from various states. The Supreme Court occupies a room in the Central building; the Senate chamber is in the north wing, the House of Representatives in the south.

CAPITOLINE GAMES, games held in ancient Rome in celebration of the deliverance of the city from the Gauls, and in honor of Jupiter Capitolinus, to whom the Romans ascribe the salvation of the capitol in the hour of danger. They were instituted 387 B.C., on motion of Camillus, after the departure of the Gauls. They were in charge of the guild of the Capitolini, whose members were chosen from those who lived on the capitol. In later times it appears they were discontinued. In 86 A.D., Domitian instituted Capitoline games, which were held every four years down to a late period of the empire.

CAPITOLINUS, Julius, Roman historian, who lived at the beginning of the 3d century, and wrote the lives of the emperors — Antoninus Pius, M. Aurelius, L. Verus, Pertinax, Albinus, Macinus, the Maximini, the Gordiani, Balbinus and Pupienus. He is one of the writers of the 'Historia Augusta,' in the editions of which his works are to be found.

CAPITULARY, (Lat. *capitula,* "chapters"), a writing divided into heads or chapters, especially a law or regal enactment so divided into heads. Laws known by this designation were promulgated by Childebert, Clothaire, Carloman and Pepin, kings of France; but no sovereign seems to have put forth so many of them as the Emperor Charlemagne, who appears to have wished to effect, in a certain degree, a uniformity of law throughout his extensive dominions. With this view it is supposed he added to the existing codes of feudal laws many other laws, divided or arranged under small chapters or heads, sometimes to explain, sometimes to amend, and sometimes to reconcile or remove the differences between them. These were generally promulgated in public assemblies composed of the sovereign and the chief men of the nation, both ecclesiastical and secular. They regulated equally the spiritual and temporal administration of the kingdom; and the execution of them was entrusted to the bishops, the courts and the *missi regii,* officers so called because they were sent by the French kings of the first and second race to dispense law and justice in the provinces. Many copies of these capitularies were made, one of which was generally preserved in the royal archives. The authority of the capitularies was very extensive. It prevailed in every kingdom under the dominion of the Franks, and was submitted to in many parts of Italy and Germany. The earliest collection of the capitularies is that of Anségise, abbot of Fontenelle. It was adopted by Louis the Debonnaire and Charles the Bald, and was publicly approved of in many councils of France and Germany. But as Anségise had omitted many capitularies in his collection, Benedict, the Levite or deacon of the church of Mentz, added three books to them (before 858). Each of the collections was considered to be authentic, and of course was appealed to as law. Subsequent additions have been made to them. The best editions of them are those of Baluze, 'Capitularia Regum Francorum' (2 vols., Paris 1677), Walter, 'Corpus Juris Germanici Antiqui' (3 vols., Berlin 1824), and of Pertz in the 'Monumenta Germaniæ Historica' (2d div., Vols. I and II, Hanover 1835–37). The best of all is Boretius, 'Mon. Germ. Hist. Legum Sectio II' (Vols. I and II, Hanover 1883–97). The capitularies remained in force in Italy longer than in Germany, and in France longer than in Italy. The incursions of the Normans, the intestine confusion and weakness of the government under the successors of Charlemagne, and above all the publication of the epitome of canon law termed the Decretum of Gratian, about the year 1150, which totally superseded them in all religious concerns, put an end to their authority in France.

CAPITULATION («a writing drawn up in heads»), in military language, the act of surrendering to an enemy upon stipulated terms, in opposition to a surrender at discretion. The word is also used to designate the instrument containing the terms. The proposition to enter into such a compact may originate either with the commander of the successful or of the defeated party. Based on the terms proposed by either, the conditions are agreed upon, being modified by the relative strength of the belligerents. Consult Article XXXV of the Second Peace Conference at The Hague (1907).

In the 15th century capitulations, as they were called, were presented by the ecclesiastical establishments in Germany to their newly-chosen abbots and bishops, who were obliged to swear to observe them as laws and conditions for their future rule. The ecclesiastical electors obtained, after the fall of the Hohenstaufen family, certain advantageous promises from the new emperors, which were called capitulations. When Charles V was proposed as emperor, and it was apprehended, on account of his foreign education, that he would disregard the German constitution, he was obliged to make oath that he would not reside without the German empire, nor appoint foreigners to office in the empire, etc. This was called his «election capitulation.» Such a *Wahlcapitulation* was afterward presented to every new emperor as a fundamental law of the empire. In this way the authority of the German emperors was constantly more and more diminished, so that at last it became merely nominal, since the electors, at the choice of every new emperor, made some new infringement on the imperial privileges. The *Wahlcapitulationen* were acknowledged bargains, certainly unique in history.

CAPITULATIONS, Turkish, the decrees governing the privileges and powers of Europeans resident on Turkish soil, so called apparently for the reason that they were divided into articles or chapters. After 1453 such privileges were frequently granted by the sultans; they were personal grants, however, and valid only for the life of the grantor. Hence they were renewed, often with modifications, by each new sultan. So we find many capitulations made with France, England and other states. The earliest of the capitulations, to which reference is often made for precedent, dates from 1535 and was granted to Francis I of France. It was more specific and formal than any preceding grant of the kind and remained in force for over 350 years. By it the French were permitted to travel and to trade according to their own customs and usages; it granted them freedom from all imposts except customs duties, also liberty in matters of religion, inviolability of domicile and the extra-territorial jurisdiction of consuls. Even if they committed a crime, they were to be arrested by an Ottoman official only in the presence of a consular or diplomatic officer of their own country. Ottoman officers, if asked by a consular or diplomatic officer to aid in the arrest of a French subject, were compelled to perform such service. The French had the full right of making wills. If they died intestate in Turkey, their own consul must take possession of their estate and liquidate or administer it for their heirs. Soon after this grant to France other nations of the Occident sought similar privileges. In 1583 Queen Elizabeth after four years of effort succeeded in establishing relations of this nature with the Sultan. This capitulation was afterward many times renewed. The Netherlands received a capitulation in 1609, and Austria in 1615.

In 1673 a new power was granted to France, namely, the exclusive right of protecting under her flag the subjects of sovereigns who had received no capitulations. This gave France prestige in Europe by placing several powers under obligation to her. But in 1675 England succeeded in gaining a right to the protection of other nations jointly with France, so that some states had the option of English or French protection. Austria in 1718 got permission for Genoa and Leghorn to use her flag.

No concession made in the capitulations to foreign powers led to greater abuses than this grant of the right to protect the citizens of sovereigns or states without capitulations. The French and English sold to native Greeks and Armenians the privilege of protection by a document which exempted them from paying duties on goods imported. Many of these became rich through this advantage, and were permitted to make a transfer of their privilege for a consideration. Ambassadors became rich through the traffic; one of the French ministers, it is stated in an official report, received more than 400,000 francs from this source, and the English Ambassador is said to have received from £2,000 to £3,000 as his share. Russia and Austria abused this right of protection for political ends. Rivals in seeking influence in Moldavia and Wallachia in 1780–82, their consuls competed with each other in granting patents of protection to the natives. By 1800 Austria had by this process more than 200,000 subjects in Moldavia and 60,000 in Wallachia. These latter were later given to Russia. In 1806 in order to embarrass Russia Napoleon put an end to the abuse and Turkey succeeded in persuading most of the foreign powers to follow his example. But this did not prevent many of the great Powers, through their consuls, taking large numbers of Turkish rajahs under their protection under one pretext or another. Many of these formed lawless crowds claiming exemption from police supervision. Many were men of wealth whose acts led to frequent diplomatic difficulties. We need not wonder, then, that in 1869 the Sultan issued an *irade* forbidding the naturalization of his subjects under a foreign government unless they had previously obtained his consent. All treaties since 1800 between Turkey and European powers are based on the capitulations, notably that of 1740. Down to the 19th century foreigners could not hold real property except under borrowed names. Since 1867 they have been allowed to hold it. After 1868 the inviolability of the domicile of a foreigner was limited to residences within nine hours' journey of a consular post. Questions of real property were determined by an Ottoman court. Religious freedom was confirmed in all treaties.

Turkey made repeated efforts to annul the capitulations. She attempted to do so at the Paris Congress of 1856, and again in 1862. But the Powers were unwilling to accede to her request. Germany renounced the capitulations in 1891, but under the most favored nation clause in her treaties she still enjoys the same privileges as formerly. All the Powers except the United States had been gradually yielding on the point of extraterritorial jurisdiction, though the consul of one accused of crime attended the trial, and if there was a denial of justice imminent, the case was made one for diplomatic intervention. America's insistence often led to a miscarriage of justice because the Ottoman government refused to furnish witnesses, and permitted the culprit to escape. Another fruitful source of trouble was in respect to Armenians, who take out naturalization papers in America and return home as American citizens. The Sultan has not recognized such naturalization since 1869, unless it has been made with his consent. England has sidestepped this difficulty by stating on the passports of Turkish subjects naturalized in Great Britain that such passports are not valid on the return of the bearer to Turkey.

The Young Turks after their advent to power repeatedly denounced the capitulations and on 11 Nov. 1914 the Ottoman government announced their abolishment. However until the Western Powers are satisfied that the judicial system in Turkey has undergone reform sufficient to ensure an impartial administration of justice, it is not likely that the Porte will be permitted to ignore these agreements altogether. See EXTRATERRITORIALITY and consult Moore, John Bassett, 'Digest of International Law' (1906); Angell, J. B., 'Turkish Capitulations' (in *American Historical Review*, Vol. VI, 1901); McLaughlin, A. C., and Hart, A. B., 'Cyclopedia of American Government' (Vol. I, New York 1914).

CAPIZ, kä-pēth', Philippines, capital of the province of Capiz, situated in the northern part of the island of Panay, four miles from the mouth of the Panay or Capiz River. The river is navigable to the city, and there is also an excellent roadstead at its mouth. There is a large local trade, particularly in rice, and connection by steamer with Manila. Capiz is also a telegraph and military station. Highroads connect the town with Iloilo and Miagao. Pop. 18,525.

CAPLIN, or **CAPELIN**, a small savory smelt (*Mallotus villosus*), found in large numbers on the Arctic Coast as far south as Cape Cod. The inhabitants of Newfoundland and Labrador catch it in large quantities at certain seasons, and many are dried and exported to Great Britain. The eggs are deposited in very great numbers in the sand along the Arctic shores, are then washed ashore by the waves, where they hatch, the fry being washed back into the sea. Adults are also washed ashore in great numbers and perish. In Greenland fossil caplin have been uncovered, enclosed in clay nodules of recent shales.

CAPMANY Y DE MONTPALAU, käp-mä-nē ē mōnt-pa-läu', **Antonio de**, Spanish critic and historian: b. Barcelona, 24 Nov. 1742; d. Cadiz, 14 Nov. 1813. He served in the wars with Portugal in 1762, left the army in 1770 and joined Olavide in his scheme for colonizing and cultivating the Sierra Morena. This enterprise terminated disastrously, and Capmany removed to Madrid, where he was chosen secretary of the Royal Historical Academy of Spain in 1790, and filled several offices in the gift of the government. He traveled in Italy, Germany, France and England. When the French entered Madrid in 1808 he fled to Seville, arriving there destitute and in rags. He was chosen a member of the Cortes of Cadiz, in which capacity he made himself conspicuous by his patriotism and active opposition to the new rulers. His works, which enjoy a high reputation in Spain, are numerous; among them are 'Memorias históricas sobre la marina, comercio y artes de la antigua ciudad de Barcelona' (4 vols., 1779–92); 'Cuestiones críticas sobre varios puntos de historia, economica, politica y militar' (1807); 'Teator historico-crítico de la elocuencia española' (5 vols., 1786–94); 'Diccionario Frances-Español' (1805); 'Código de las costumbres marítimas de Barcelona' (2 vols., 1791). Of these, the 'Memorias,' the 'Cuestiones' and the 'Código' contain valuable details on the commerce, industry and maritime laws of the Middle Ages. He is equally famed for his philological works, the chief of which are 'Discursos analiticos sobre la formación y perfección de las lenguas, y sobre la castellana en particular' (1776) and 'Filosofia de la elocuencia' (1776; London 1812; Gerona 1826). The purity of his language led the Real Academia Española to include his name in the 'Catálogo de Autoridades del Idioma.' Consult Sempere y Guarinos, 'Ensayo de una biblioteca española' (6 vols., Madrid 1785–89).

CAPNOMANCY, divination by smoke, one of the modes of divination resorted to by the ancients. They used to burn vervain, or some other sacred plant, and observe the form and direction which the smoke took in escaping, and from these circumstances they drew their auguries. Sometimes the smoke of sacrifices was observed instead of that of vervain. When this smoke was thin and transparent and ascended in a straight column it was considered a good omen; if the contrary it was thought and opaque, the omen was bad. Another method of acquiring a knowledge of the future by capnomancy was to throw the seeds of jasmine or poppy on burning coals, and to observe the smoke which rose from them.

CAPO D'ISTRIA, Austria (the ancient ÆGIDA, later JUSTINOPOLIS), seaport on the Gulf of Trieste, nine miles south of Trieste, in the crownland of Istria. It is connected with the mainland by a causeway rather more than half a mile long. It is defended by an old fort now going to decay. It contains a cathedral, a lofty edifice, faced in the Venetian style with marble, and containing some fine paintings, sculptures and arabesques. It is the seat of a bishop, and has six monasteries and two nunneries, a gymnasium, several hospitals and a penitentiary. There are manufactories of soap, candles, leather and sea-salt; and there is also a considerable trade in wines, oil and fish. After the 10th century Capo d'Istria belonged, alternately, to the Venetians and Genoese, till finally, in 1478, it succeeded in making itself independent of the latter with the aid of the former. Capo d'Istria now became the capital of Istria, and along with it came into the possession of Austria in 1815. Pop. 11,765 (largely Italian).

CAPO D'ISTRIAS, kä-pō-dēs'-trē-ạs, or **CAPO D'ISTRIA, Ioannes Antonios**, COUNT, Greek statesman: b. Corfu, 11 Feb. 1776; d. Nauplia, 9 Oct. 1831. His family had been settled in Corfu since 1373, but originally came from the Illyrian town of Capo d'Istria. He devoted himself to political life, and in 1809, after holding a high place in the Ionian Islands, entered the diplomatic service of Russia. Here his policy tended to the separation of Greece from Turkey. In 1828 he entered on a seven years' presidency of Greece; but whether from his attachment to Russian interests, or from the jealousy and impatience of restraint of the chiefs, he speedily became extremely unpopular. Several of these unruly chiefs belonging to the islands and to the province of Maina at last, in the spring of 1831, rose in open rebellion against him, demanding a convocation of the National Assembly, the establishment of the liberty of the press, and the release of certain state prisoners, especially of Petros Mauromichalis, one of their own number whom D'Istrias had arrested and imprisoned. The President obtained the aid of Russia, but before the insurrection could be quelled he was assassinated in a church at Nauplia, by Constantine and George Mauromichalis, the brother and nephew of Petros Mauromichalis. Consult Phillips, 'The War of Greek Independence' (1897).

CAPONIÉRE, kä-pŏ-nyär, or **CAPONNIÈRE**, in fortification, a place covered against the fire of the enemy on the sides, sometimes also above, and serving for the connection of two works or for maintaining an important point. In particular: (1) A passage secured by two parapets, in the form of glacis, which leads through the dry ditch from one work to another; for instance, from the chief wall to the ravelin. If danger is to be apprehended only from one side, and consequently only one parapet is made, it is called a demi-caponière; if it is covered above with hurdles or with wood, it is called a coffer: but this word is often used indifferently for caponière. (2) Small block-houses so located as to fire along a dead angle. Coehorn laid out similar but less useful works below the glacis, and Scharnhorst proposed them, under the name of field-caponières, for the salient angles of field fortification. Caponières are also known as tambours in many recent works on field fortifications. See FORTIFICATION; TAMBOUR.

CAPOTE, kä-pō'tā, **Domingo Mendez**, Cuban statesman: b. Cardenas 1863. He was graduated at the University of Havana and became one of the best-known lawyers in Cuba. Subsequently he was a professor in the University of Havana for many years. In December 1895 he joined the insurgents under Gen. Maximo Gomez; became a brigadier-general, and was appointed civil governor of Matanzas and of Las Villas. In November 1897 he was elected Vice-President of the Cuban republic. When the Cuban Constitutional Convention appointed a commission of five members to confer with President McKinley and Secretary Root concerning the future relations of the United States and Cuba, he became its leader. The conference was held in Washington, D. C., in April 1901.

CAPOUL, kä-pool, **Joseph Amédée Victor**, French tenor singer: b. Toulouse, 27 Feb. 1839. He was educated at Paris, and sang there in the Opéra Comique, 1861–72, where he was very popular, especially in his rôle as Gaston de Meillagré in Auber's 'Premier jour de bonheur.' He has also sung in New York, London, Vienna, Saint Petersburg and other cities, being everywhere very successful. In 1892 he accepted the position of professor of operatic singing at the National Conservatory in New York. In 1898 he took up his residence in Paris, being in great demand as a singing teacher. In 1900 he became stage director at the Grand Opéra.

CAPPADOCIA, kăp-pä-dō'shĭ-ạ, in antiquity, one of the most important provinces in Asia, once a famous kingdom; in its widest extent bounded west by Lycaonia, south by Cilicia and Syria, east by Armenia and north by the Pontus Euxinus. In the period of the Persian government Cappadocia comprehended all the country between the Halys and Euphrates. By the former river it was separated from Phrygia and Paphlagonia; by the latter, from Armenia: therefore the region afterward called Pontus was comprehended in this territory. The Persians divided it, according to Strabo, into two satrapies, which bore the name of Cappadocia Magna, afterward Cappadocia Proper, and Cappadocia Minor, afterward Pontus. This division, however, was not always strictly observed. The Persian satraps governed, at a later time, under the title of kings, and sometimes made themselves independent. At the time of the famous retreat of the 10,000 Greeks, both the Cappadocias seem to have been under the rule of Mithridates I, who had participated in the conspiracy of Cyrus the Younger, but retained his government and became, after the defeat of Cyrus, again dependent upon the kings of Persia. Alexander the Great received tribute from Ariarathes, but the latter's son did not recognize Alexander's successors. It changed sides frequently during the civil struggles of Cæsar and Pompey, Octavian and Antony and became a Roman province in 17 A.D. Cappadocia Magna was a good grazing country, and also well adapted for the cultivation of grain, especially wheat; but wood was scarce. Mazaca, afterward Cæsarea, now Kaisariyeh, was the residence of the kings of Cappadocia. The name of Leukosyri (White Syrians) is said by Strabo to have been applied to the Cappadocians, as if to distinguish them from the dark Syrians who dwelt on the east of Mount Amanus. The ancient population is at present represented by a few mountain tribes called Taktadji. Some anthropologists connect them with the Hittites. However, there is considerable difference of opinion in regard to their ethnic origin. Consult Chantre, ‘Recherches anthropologiques dans l'Asie occidentale’ (Lyons 1895); Grothe, ‘Meine Vorderasienexpeditionen’ (Leipzig 1911); Von Luschan and Petersen's ‘Reisen in Lykien’ (Vienna 1889); Von Luschan, ‘Tachtadschy’ (in *Archiv für Anthropologie* 1901).

CAPPONI, käp-pō'nē, **Gino,** MARCHESE. Italian scholar and historian: b. Florence, 14 Sept. 1792; d. there, 3 Feb. 1876. He traveled widely and devoted himself almost entirely to his studies in spite of the fact that he became blind early in life. Returning to Italy he founded at Florence the *Antologia Italiana,* which was suppressed in 1832, when he at once founded the *Archivo Istorico Italiano.* For a short time in 1848 he was at the head of the Tuscan government, attacks by the Radicals causing his temporary retirement to private life. In 1859 he was a member of the Constitutional Convention of Tuscany; he was also made a senator of Italy; and in 1862 was at the head of the Historical Commission for Tuscany, Umbria and the Marches. He wrote ‘Storia della repubblica di Firenze’ (1875), a standard work; and had a part in the preparation of a lexicon by the Accademia della Crusca, and in the editing of texts of Dante's ‘Divine Comedy’ (Florence 1837). Consult Tabarini, ‘Gino Capponi’ (Florence 1879), and Von Reumont, ‘Gino Capponi ein Zeit-und Lebensbild’ (Gotha 1880).

CAPPS, Edward, American philologist: b. 21 Dec. 1866. He was graduated from Illinois College, 1887; took his doctor's degree at Yale, 1891; and was tutor in Latin at the latter place, 1890–92. He was successively associate professor and professor of Greek in the University of Chicago from 1892 to 1907. In the latter year he became professor of classics at Princeton University. Besides a number of philological papers, he has written ‘From Homer to Theocritus’ (1902); ‘Four Plays of Menander’ (1910); and sundry other articles in classical philology.

CAPPS, Washington Lee, American naval constructor: b. Portsmouth, Va., 31 Jan. 1864. A graduate of the United States Naval Academy in 1884 he rose by grades to the position of naval constructor in 1895. After service at the Union Iron Works 1896–98, and at Washington 1899–1901, in 1903 he was appointed chief constructor of the navy with the rank of rear-admiral. Reappointed four years later, he retired in 1910. President Wilson appointed him commissioner to represent the United States at the International Maritime Conference in 1913.

CAPRARA, kä-prä'rä, **Giambattista,** CARDINAL, Italian ecclesiastic: b. Bologna, Italy, 29 May 1733; d. Paris, 21 June 1810. He studied theology, became vice-legate of Ravenna in 1758 under Benedict XIV, and in 1785 was sent by Pius VI, as nuncio to Vienna, to remonstrate with the Emperor Joseph on his conduct in relation to Church matters. His remonstrance proved ineffectual, but in 1792 he was appointed a cardinal, shortly afterward a member of the state council, and in 1800 bishop of Jesi. In 1801 he went to Paris as legate of Pius VII, and conducted the negotiations with Napoleon with so much success that the first concordat was speedily concluded. Shortly after he was appointed archbishop of Milan, and in 1805 he crowned Napoleon king of Italy, placing on his head the iron crown of Lombardy. The cardinal left his fortune to the hospital in Milan.

CAPRERA, kä-prā'ra, a small island to the northeast of Sardinia, and separated from it by a narrow strait. It is six miles long from north to south, and two miles broad. It is fertile, and produces both corn and good pasture and is connected with the island of Maddalana by a causeway and drawbridge. It is well known as the ordinary residence of Garibaldi, who after 1854 possessed a dwelling-house on the island, along with a piece of ground which he farmed until his death there 2 June 1882.

CAPRI, kä'-prē, Italy, an island in the beautiful Gulf of Naples, which contributes not a little to the charms of this favorite scene of nature. Capri, five miles long and three broad, lies at the entrance of the gulf, and consists of two mountains of limestone, remarkable for their picturesque shape, and a well-cultivated valley. The inhabitants amounting to about 5,000, are occupied in the production of oil and wine, in fishing and in catching quails, which come in immense numbers from Africa to the shores of Italy. Every spot on the island which can be made productive is cultivated. In fact, agriculture all around Naples is in the highest state of perfection. The town of Capri is the seat of a bishop. A high rock separates Capri from the little town of Anacapri, which is reached by 522 steps cut in the rock in 1876. The highest point on the island is Mount Solaro, which rises 1,920 feet above the sea. Capri has a delightful climate and pure air, and is visited annually by over 30,000 tourists. It is a favorite summer resort for the Neapolitans, being distant but 20 miles southwest of their city. The supply of drinking water is far from satisfactory. With the Romans Capri was called Capreæ. Augustus obtained it from the Neapolitans in exchange for Ischia, and made it a place of agreeable retreat, but never made use of it. Tiberius spent here the last seven years of his life in degrading voluptuousness and infamous cruelty. The ruins of his palaces are still extant, and other ruins are scattered over the island. The island of Capri is notable for several remarkable caverns or grottoes in its steep, rocky coast. By far the most remarkable of these is unquestionably the celebrated Grotta azzurra (Blue Grotto), which was discovered by a singular accident in the summer of 1832, an Englishman while bathing having observed the opening in the rocks which forms the entrance to the grotto, and swum into it. It gets its name from the fact that, while the sun is shining outside, all the objects within the cavern — rocks, water and sand — are tinged with a beautiful blue color, very soft and agreeable to the eye. The cavern is elliptical in form, measuring about 1,200 or 1,300 feet in circumference; its height is about 41 feet with water 48 feet deep, and its roof and sides bristle with stalactites. The blue color within the grotto is supposed to be caused by the refraction of the rays of light in passing through the water before entering the cave. The blue rays, with those next to them, the violet and the indigo, being the most refrangible, are the only rays that are admitted, the others — red, orange, etc., being dispersed in the water. In another part of the coast there is another grotto which exhibits phenomena precisely similar, except that the objects in this one are clothed with a green instead of a blue color. It is hence called the Grotta verde (Green Grotto). The English captured the island in 1806 and fortified it, but lost it to the French two years later. They recovered it in 1813 and restored it to King Ferdinand IV of Sicily. Consult Allers, 'Capri' (Munich 1894); Furchheim, 'Bibliographia dell' isola di Capri' (Naples 1899); Gregorovius, 'Die Insel Capri' (Leipzig 1897); Weichardt, 'Das Schloss des Tiberius und andere Römerbauten auf Capri' (Leipzig 1900).

CAPRIC ACID. See DECOIC ACID.

CAPRICCIO, kä-prē'chō (*Caprice*), is the name applied to a musical composition, in which the composer follows the bent of his humor, the aim being to produce piquant and striking effects. The *capriccio* may be used with propriety in pieces for exercise, in which the strangest and most difficult figures may be introduced, if they are not at variance with the nature of the instrument or of the voice. A shorter piece of the same nature is often called *capriccietto*.

CAPRICORNUS (Lat. *caper*, «a goat,» and *cornu*, «a horn»), «the goat,» one (the 10th) of the 12 signs of the Zodiac, between Sagittarius and Aquarius; also the corresponding zodiacal constellation, one of Ptolemy's original 48 and designated by the sign ♑, representing the horns of a goat. One of its brightest stars, Alpha, is a wide double, easily separated by the naked eye by anyone with good eyesight. Capricornus is surrounded by Aquila, Aquarius, Piscis Austrinus, Microscopium and Sagittarius. The star was celebrated among the ancients, who regarded it as of good omen, and as marking the southern tropic or winter solstice, whence it was known as «the Southern Gate of the Sun.»

CAPRIFICATION, the fertilization of the flowers of the Smyrna fig with pollen derived from the wild fig, or caprifig. From time immemorial it has been the custom of Orientals to break off the fruits of the caprifig, bring them to the edible-fig trees and tie them to the limbs. From the caprifigs thus brought in there issues a minute insect, which, covered with pollen, crawls into the flower receptacles of the edible fig, fertilizes them, and thus produces a crop of seeds and brings about the subsequent ripening of the fruit. It has been shown that the varieties of the wild fig or caprifig are the only ones which contain male organs, while the varieties of the Smyrna fig are exclusively female. In the caprifig there are said to exist in Mediterranean regions three crops of fruit,— the spring crop, a summer crop and a third, which remains upon the trees through the winter. The fig-insect (*Blastophaga grossorum*) over-winters in the third crop, oviposits in the spring crop, develops a generation within it, each individual living in the swelling of a gall-flower (a modified and unfertile female flower), and, issuing from it covered with pollen, enters the young flower receptacles of the young Smyrna fig, which are at that time of the proper size, and makes an attempt to oviposit in the true female flowers, fertilizing them at the same time by means of the pollen adhering to their bodies. The life history of the insect from that time on is not well understood, but the *Blastophaga* has been known to occur again in the over-wintering crop of figs. The effect of caprification on the young Smyrna figs becomes readily visible within a few days; before the *Blastophaga* enters the fig the latter is transverse and strongly ribbed, while a few days after fertilization the fig swells up and becomes rounded and sleek. The male *Blastophaga* is always wingless. It has no ocelli, and its compound eyes are greatly reduced in size. The fact that the male rarely leaves the fig in which it is hatched might almost be inferred from these facts of winglessness and partial blindness. When this wingless male issues from the seed-like gall in which it is contained, it seeks a female gall in the interior of the same fig, gnaws a small hole through its cortex, inserts its extremely long, almost telescopic, abdominal extremity through the hole, and fertilizes the female. The female subsequently, with her powerful jaws, gnaws the top of the gall off and emerges, crawling around the interior of the fig, and eventually forcing her way through the ostiolum, almost immediately seeking for young figs, which she enters, and should the fig entered prove to be a caprifig, lays her eggs at the base of as many flowers as she can find, and then dies. Should the fig entered, however, be a Smyrna fig, either through the fact of the caprifig from which she issued having been hung in the branches of a Smyrna-fig tree, or from the fact that she has flown to an adjoining Smyrna-fig tree, she walks around among the female flowers seeking for a proper place to oviposit. It is this futile, wandering search, when her body is covered with pollen from the caprifigs, that produces the extensive and almost perfect fertilization of the entire number of female flowers. The young larva is a delicate little maggot curved upon itself and showing no visible segmentation. In the full-grown larva the segments are more apparent, and with the growth of the larva the gall at the base of the male florets becomes hard, and greatly resembles a seed, turning light brown in color. The male and the female pupa each occupies a greater portion of the interior of the gall. Consult 'The Fig' (United States Department of Agriculture, Washington 1901).

Although figs are raised in California and the Southern States they have long been inferior to the Smyrna fig, the standard kind of commerce, which owes its peculiar flavor to the number of ripe seeds which it contains. These seeds are obtained only by the process described above, and the United States Department of Agriculture devoted much attention to caprification, with a view to the development of the American fig industry. The fig insects were introduced in California in 1899 and have greatly benefited the fig industry. It is now possible to produce Smyrna figs of the fine quality. About 250 tons were produced in 1915. See Fig.

CAPRIMULGIDÆ, kăp-rĭ-mŭl'jĭ-dē, the goat-suckers, better nightjars (so called from a superstition regarding their habits), a family of birds of puzzling affinities, but nearest to the swifts (*Cypselidæ*), with which, and the humming-birds, they are often considered to constitute an order, *Macrochires.* The family is characterized by a small bill, enormous gape, fringed with elongated, stiff bristles, elongated tail of 10 soft rectrices, long pointed wings, very small feet with the middle claw pectinate, and very lax plumage. Two subfamilies, the *Caprimulginæ* or true goatsuckers, and the *Nyctibiinæ* of tropical America, are recognized, to which the oil-birds (*Steatornis*), and *Podargus* and its allies, are sometimes added as two more. The family is nearly cosmopolitan, and comprises 12 or 15 genera and perhaps 100 species, all birds of more or less crepuscular habits, which catch insects on the wing like swallows. The «night-hawk» and «whip-poor-will» are the common species of the eastern United States.

CAPRIVI, kä-prē'vē, **Georg Leo,** Graf von, sometimes called Caprivi de Caprara de Montecuculi, German soldier and statesman; second Chancellor of the German Empire: b. Charlottenburg, 24 Feb. 1831; d. Skyren, 6 Feb. 1899. He studied in Berlin; entered the army in 1849; fought in the campaigns of 1864 and 1866; and was appointed major and a member of the general staff of the First Army Corps. In the Franco-German War of 1870 he was chief of staff to the 10th Army Corps, served with distinction at Metz and Orléans and in the Loire campaigns. In 1882 he became commander of the 30th Infantry Division at Metz and in 1883–88 he was at the head of the Admiralty. This appointment was made by Bismarck and caused great dissatisfaction among the officers of the navy. Caprivi, however, soon mastered the details of the department, and the successful reorganization of the navy upon its present basis is in great part due to his capable and energetic direction. In 1888 he became commander of his old army corps. Hence he was removed, on the fall of Bismarck, in 1890, to become Imperial Chancellor and Prussian Prime Minister. His principal measures were the army bills of 1892 and 1893, and the commercial treaty with Russia in 1894, in which year he retired. He was made a count in 1891. His position as Bismarck's successor was one of peculiar difficulty and trial, but he showed himself an able and faithful administrator. Like Bismarck he was a man of giant stature, of great mental power and with an incredible capacity for work. Consult 'Die Reden des Grafen von Caprivi . . . 1883–93' (Berlin 1894).

CAPROIC ACID. See Hexoic Acid.

CAPRON, Allen Kissam, American military officer (son of Allyn Capron, q.v.): b. Brooklyn, N. Y., 24 June 1871; d. Las Guasimas, Cuba, 24 June 1898. He enlisted as a private (1890), and rose to a second lieutenancy (1893), joining the «Rough Riders» on the outbreak of the war with Spain. He was made a captain for bravery, and was the first American army officer who fell in that war.

CAPRON, Allyn, American soldier: b. Tampa, Fla., 27 Aug. 1846; d. Fort Myer, Va., 18 Sept. 1898. He was graduated at West Point, 1867, and entered the 1st Artillery, receiving his captaincy 4 Dec. 1888. During the Sioux campaign of 1890 he made a brilliant record at the battles of Wounded Knee and Drexel Mission. During the war with Spain, 1898, he opened the fight at El Caney, Cuba, and shattered the first flagstaff in Santiago. During this campaign he was taken ill with typhoid fever, and succumbed to its attack. He was a fine mathematician, and a recognized authority on artillery and tactics. His father, Erastus Allyn Capron, was killed at Churubusco, in the Mexican War, 20 Aug. 1847.

CAPRYLIC ACID, or **HEXOIC ACID** ($C_6H_{12}O_2$), an acid found in butter and cocoanut oil. It is obtained from the latter by saponification with caustic potash and distillation with dilute sulphuric acid. It is a fermentation product of butyric acid. It has an oily appearance and an unpleasant odor resembling sweat.

CAPSICIN, a name given to two apparently different substances. One described by Braconnot, obtained from chilli pepper, is an acrid oil or oleoresin, of a reddish-brown color, the vapor of which excites sneezing and coughing. It is probably a mixture of different bodies. The other is a resinoid substance obtained from cayenne pepper; it is brown with a golden tint, has the consistency of tar, an aromatic smell and pungent taste, and is used in America as a powerful stimulant in influenza, fever, indigestion and other disorders, and externally as a rubefacient. Quite recently a volatile alkaloid, also called capsicin, has been obtained from chilli pepper, by first removing the acrid resin, then making the fluid alkaline, and extracting with petroleum spirit. On evaporating, a substance is produced with an odor like that of conia. It is distinguished from conia and nicotine by a variety of reactions.

CAPSICUM, a genus of plants of the order *Solanaceæ,* consisting of annual or biennial plants, bearing membranous pods containing several seeds, noted for their hot, pungent qualities. *C. annuum,* a native of South America, furnishes the fruits known as chillies. These, as well as the fruits of *C. frutescens* and other species, are used to form cayenne pepper. For this purpose the ripe fruits are dried in the sun or in an oven, and then ground to powder, which is mixed with a large quantity of wheat flour. The mixed powder is then turned into cakes with leaven; these are baked till they become as hard as biscuit, and are then ground and sifted. Cayenne pepper is largely adulterated with red lead and other substances. *C. fructus* is the dried ripe fruit of *C. fastigia-*

tum, imported from Zanzibar. It is a small, oblong, scarlet, membranous pod, divided internally into two or three cells containing numerous flat, white, reniform seeds. It has no odor; its taste is hot and acrid. *C. baccatum*, or bird pepper, is a perennial in tropical latitudes. *C. grossum* has a large, long, ovate fruit, known as bell pepper, and is used either ripe or unripe, except for cayenne pepper, when the dried ripe fruit is employed. Capsicum fruits are used medicinally, in powder or as a tincture, externally, or as a gargle in cases of malignant sore throat, and internally as a stimulant in cases of impaired digestion.

By reason of the resin-like body, capsicin, which is contained in the fruits of these plants, they possess very active irritant properties. The pure crystals of capsicin are extremely virulent, and readily cause severe poisoning; but the ground fruit is less active, and is of service in medicine, both for external and internal medication.

Externally, capsicum is used as an irritant to cause redness of the skin or to blister, thus affecting related visceral areas within the body. It is thus employed in bronchitis, in early stages of pneumonia, in pleurisies, and in joint and nerve affections. Internally, capsicum is used to stimulate the appetite and to increase the amounts of gastric and intestinal juices. It is particularly serviceable in the gastritis of alcoholism. All capsicum should be excluded from the diet of patients with disease of the kidneys or acute disease of the genito-urinary system. See PEPPER.

CAPSTAN (Fr. *cabestan*, probably from a derivative of Lat. *capistrum*, a halter, from *capere*, to hold), an apparatus largely used on ships for moving heavy weights and by various methods for the application of power. Constructed on the mechanical principle of the wheel and axle, its axis, unlike that of the windlass, is vertical. The capstan may be operated either by steam power or by means of a lever set in its socket and worked by horses or pushed by hand, the last method usually requiring several men. When used elsewhere than on shipboard, the capstan generally has some specific name. Thus, when employed for raising coal from pits it is commonly called a gin; if worked by horses, it is known as a whim-gin. Capstans were formerly made of wood, but are now almost universally of iron. The upright barrel of a capstan is constructed around a spindle. The barrel is sometimes smooth, and sometimes for increase of friction has, running up and down its surface, ribs or ridges called whelps. In the capstan-head or drum-head, surmounting the barrel are holes for the levers or capstan-bars used to revolve the barrel. Being smaller at its centre than at the top or bottom end, the barrel has a curve from above and below, whereby a rope wound by working the capstan slips toward the concave part so formed. By this device a length of rope may be compactly and securely wound and kept in place for repeated use. On the circumference of a pawl-head at the bottom of the barrel are pivoted pawls which catch a pawl-rim or ratchet-ring fastened to the platform or floor on which the capstan is fixed. There are various other devices for increasing friction, the prevention of slipping and reverse operation of the mechanism.

CAPSULE, *in botany*, a dry fruit containing several seeds, sometimes a large number, and opening of itself by means of valves or pores when it comes to maturity. According as it contains one, two, three or more cells, the capsule is called unilocular, bilocular, trilocular, etc., and when it has many cells it is called multilocular.

In anatomy a capsule is a mass of fibrous, connective tissue cells surrounding or supporting an organ, either as a bag, as is the case in the kidneys; or as a framework, as in the liver. The capsule is usually an integral portion of the structure of an organ.

In bacteriology, the term is applied to the thin envelope which surrounds certain microorganisms.

In pharmacy gelatin capsules are widely used for purposes of rendering medicines tasteless.

CAPTAIN. This is one of those many words derived from the Latin of the Middle Ages, and now to be found in all the different idioms of Europe. Captain comes from the Latin *capitaneus*, from *caput*, head, and signified, first, a governor of a province, who in the first half of the Middle Ages was generally a military man. Thus the word captain soon came to be used chiefly to denote a high, or rather the highest, military officer. In the latter part of the Middle Ages, when armies were not yet so regularly divided and subdivided as at the present time, captains were the commanders of those small bodies of which the armies consisted. These were generally collected by their commander, who entered with his company into the service where most pay or most booty could be obtained. The practice of waging war by troops collected in this manner prevailed to the greatest extent in Italy, where the continual quarrels of the numerous small states afforded ample employment to the unsettled and the dissolute. These companies play an important part in the history of the Middle Ages, particularly that of the two centuries preceding the Reformation, and had a very important influence on the manners and morals of the south of Europe.

CAPTAIN, in most modern armies, is the commander of a company of foot, a battery of artillery, or a squadron of horse, or a staff-officer of equivalent rank. In England companies and batteries are often commanded by majors. In the United States cavalry a captain commands a troop, and a major a squadron of four troops. In the United States army the captain nominates the non-commissioned officers of his company who are appointed by the colonel of the regiment; and from the sergeants he selects the first sergeant, mess-sergeant and supply-sergeant.

CAPTAIN, in the navy, an officer commanding a ship of war or a staff officer of equivalent rank. The naval captain is next in rank above the commander, and in the United States ranks with a colonel in the army.

CAPTAIN-GENERAL, the commander-in-chief of an army or of all the military forces of a country. In France it was an ancient title which conferred an almost unlimited power on the person who possessed it in the district where he commanded. But it never corresponded to that of generalissimo except in the case of the Duke of Savoy, in 1635, in the time of Louis XIII. The title is not in use at present, nor would it agree with the existing organization of the administration. In Spain the rank of a captain-general corresponds with that of a marshal of France, the captain-general having command of an army or army corps. The title was also given to the head of a province in the Spanish colonies in South America, which were divided into vice-royalties and captain-generalships (*capitanias-generales*); thus Chile used to be a captain-generalship. The captains-general were not placed under the viceroys, but accountable only to the king through the council of the Indies. The captain-general of Venezuela, for instance, had no connection with the viceroy of New Granada. They decided, in the last instance, on all legislative, judicial and military affairs, and presided in the *real audiencia*. The time during which these governors remained in power was limited to a few years, probably in order to prevent them from becoming too powerful. The consequence was, that the colonies were oppressed the more to enrich the governors, for rich every one was when he left his office.

Captain of a merchant ship, he who has the direction of a ship, her crew, lading, etc. In small vessels he is more ordinarily called master, which indeed is the correct title.

CAPTION, *in law,* signifies the heading or that part of a legal instrument such as an indictment or commission, which states when, where and by what authority it is executed. In Scotch law it signifies a warrant of imprisonment issued against a party to enforce an obligation, being now confined to a warrant served upon a party who has illegally retained papers in a lawsuit that had been borrowed by him, and intended to compel the return of the papers. The word is not now used with any other signification in Great Britain; it is never employed to denote the heading of, for instance, a newspaper article.

CAPTIVI, căp-tē'-vē ('The Captives'), a comedy of Plautus, declared by Lessing to be the finest piece that had ever been put upon the stage. Such an estimate, even from so great a literary critic, savors rather of enthusiasm than of judgment. But the play has unusual merits. The plot, while simple, is very closely woven; the deception and its disastrous discovery, upon which the action turns, are handled to a certain extent in the spirit of tragedy; and the portrayal of character is so sympathetic that the interest of the audience is aroused almost equally for the deceivers and for the deceived. Plautus himself, both in the prologue and in the epilogue, dwells upon the elevation of tone which distinguishes this play from the usual run, and expresses his regret that playwrights find few comedies, such as this, through which good men may be made better. This conception of the function of comedy is very rare indeed in Plautus, whose chief concern was to make his plays amusing but not necessarily edifying. In 'The Captives' the moral lesson is the more impressively taught because the hero has known only the life and outlook of a slave ever since he was stolen from home in early childhood. But this slave has the soul of a gentleman, and no scene in the play is greater than that in which, after the discovery of his real status, he fearlessly defends his loyalty to the master, now happily beyond reach, for whose sake he has imperilled his own life. There is a vivacious translation in the 'Loeb Classical Library' by Paul Nixon, 'Plautus, Volume I' (New York 1916). Consult also the excellent chapters on Plautus in Sellar, W. Y., 'Roman Poets of the Republic' (3d ed., reissued, Oxford 1908) and Duff, J. W., 'A Literary History of Rome' (2d ed., London 1910).

Nelson G. McCrea.

CAPUA, kä'poo-ä, Italy, city in the province of Caserta, 18 miles north of Naples, on the Volturno, which is crossed by a handsome bridge. The district is very fertile, but somewhat unhealthy. It is the seat of an archbishopric, and was the principal fortress that covered the approach to Naples from the north. It was in consequence of great importance to the former kingdom of Naples. It has two magnificent gates, three principal streets, two handsome squares and three public fountains. The town is dirty and badly built. The principal public buildings are the cathedral with a cupola supported by 18 columns, entirely modernized; the church of the Annunciation; the governor's palace, the town-hall, a museum with many ancient works of art, etc. The ancient city was situated two and a half miles southeast from the modern town, which was built from its ruins on the site of the ancient Casilinum by the Lombards in the 9th century. The site is now occupied by a considerable town called Santa-Maria-di-Capoa-Vetere. The ancient Capua, one of the finest and most agreeable cities of Italy, was of such extent as to be compared to Rome and Carthage. Hannibal wintered at ancient Capua after the battle of Cannæ, and thus not only lost time, but also is commonly said to have rendered his army unfit to follow up the advantage he had gained. It was a favorite place of resort of the Romans, on account of its agreeable situation and its healthy climate; and many existing ruins attest its ancient splendor. In 456 A.D. it was devastated by the Vandals under Genseric, and in 840 the Saracens completely destroyed it. The Torre Mignana inside, and the Capella de' Morti outside, the town, commemorate the bloody attack on Capua in 1501 by Cæsar Borgia. Not far from the city is the field where the soldiers of Garibaldi and of Piedmont defeated King Francis II of Naples, 1 Oct. 1860. Pop. 13,319.

CAPUANA, kä-poo-ä'nä, **Luigi,** Italian poet, novelist and critic: b. Mineo, Sicily, 27 May 1839. Having devoted himself to journalism, he settled in Florence in 1864, where he wrote dramatic criticisms; from 1868 until 1877 he lived in his native town, then in Milan, again as a journalist. In 1902 he became professor at Catania. With Verga he stands at the head of the Sicilian group of "realists" who, with their vivid portrayal of Italian regional life, represent one of the most virile branches of Italian fiction. His best-known work is 'Giacinta' (1879), a naturalistic novel. Besides this he has published several volumes of short stories, among them: 'Profiles of Women' (1881); 'Homo' (1883); and two collections of charming fairy tales: 'Once upon a Time' (1882) and 'Fairy Land' (1883). A curious specimen of rhythmical prose is his ‘Semi-Rhythms’ (1888), in praise of worldly joy and beauty.

CAPUCHIN, kăp-ū-shēn or kap-ū-chĕn, the name of several animals in which the growth of the hair or feathers upon the head forms a sort of hood suggesting that of a Capuchin friar. Certain monkeys are so called, especially the South American sapajous of the genus *Cebus* and one or more of the macaques (q.v.). A breed of domestic pigeons is also so called.

CAPUCHINS, an order of mendicant friars in the Roman Catholic Church founded in 1528 in virtue of a bull of Clement VII. Its founder, Matteo di Bassi, was a member of the rigorist section of the Observantine Franciscans, who sought to restore the rule of perfect poverty and humility, and to be of aid to parish priests in the cure of souls. The Capuchin friars obtained their name from the capuerce, cowl or hood which they wore. They were vowed to live according to the rule of Saint Francis in hermitages and to labor for the conversion of notorious sinners. Their churches were to be bare of ornament. Soon after their foundation they did heroic service in ministering to those stricken by the plague which at that time ravaged all Italy. The third vicar-general of the order, Bernardino Ochino, brought the Capuchins into discredit by his notorious leanings toward Protestantism, and the fraternity was interdicted from preaching by Paul III, and would have been suppressed had not Cardinal Sanseverino, archbishop of Naples, interceded for them. Paul also forbade them to establish any convents beyond the Alps, but his successor, Gregory XIII, revoked that decree. Again, Gregory XIV in 1591 withdrew from them the faculty of ministering in the confessional; but it was restored to them 10 years later by Clement VIII. Finally, in 1619 the fraternity was restored to good standing, and was even erected into an order administratively independent of the general of the Franciscans, and their vicar-general assumed the style of minister-general. Ever since, the Capuchins have been recognized as eminently useful servants of the Church. The order conducts missions in all quarters of the globe, and has the reputation of being very successful in winning converts. In 1775, the order had 64 provinces, with 31,000 members, the largest number reached in their history. In Austria, they are most numerous, but there are also 22 scattered missions. Two provinces exist in the United States,— one centres at Detroit, Mich., and one at Pittsburgh, Pa. There is also a missionary district in California. An order of Capuchin nuns was established at Naples in 1538.

CAPULETS AND MONTAGUES, the English spelling of the names of the Cappelletti and Montecchi, two noble families of northern Italy, according to tradition of Verona, chiefly memorable from their connection with the legend on which Shakespeare has founded his tragedy of ‘Romeo and Juliet.’ Consult Daniel, ‘Originals and Analogues of Romeo and Juliet’ (in ‘New Shakespeare Society Publications,’ London 1875); Furness, H. H., ‘Romeo and Juliet’ (New Variorum edition, Philadelphia 1871; last revision 1903).

CAPUS, kä-pü' (**Vincent Marie**), **Alfred**, French litterateur: b. 25 Nov. 1858. He was educated at Aix-en-Provence and at the Lycée Condorcet, Paris. He was intended for the engineering profession and to this end received a technical training. His tastes, however, turned him to literature; he entered the journalistic field as member of the staff of the *Figaro*. He soon became known as a masterful critic and satirist. He published ‘Qui perd gagne’ in 1890; ‘Faux départ’ (1891); ‘Monsieur veut rire’ (1893); ‘Années d'aventures’ (1895). These novels, while very successful, have been overshadowed by his dramas, in which his genius is best revealed, and which in 1914 led to his selection as a member of the French Academy. The plays are ‘Brignol et sa fille’ (1895); L'Innocent,’ with Alphonse Alais (1896); ‘Rosine’ (1897); ‘Mariage bourgeois’ (1898); ‘Les maris de Léontine’ (1900); ‘La veine’ (1901); ‘La petite fonctionnaire’ (1901); ‘Les deux écoles’ (1902); ‘La châtelaine’ (1902); L'Adversaire,’ with Emmanuel Arène (1903); ‘Notre jeunesse’ (1904); ‘Monsieur Piégois’ (1905); L'Attentat,’ with Descaves (1906); ‘Hélène Ardouin’ (1913). He also published ‘L'Institut de beauté,’ and ‘Notre époque et le théâtre.’

CAPUT MORTUUM (Latin), literally, a dead head; a fanciful term much used by the old chemists to denote the residuum of chemicals when all their volatile matters had escaped; hence the word is figuratively used of anything from which all that rendered it valuable has been taken away. It is used in historical research in this sense.

CAPUTIATI, kä-pū-shĭ-ä'tĭ (from Lat. *caput*, head), a Christian sect which arose in France in the 12th century, and so called because they wore as a distinguishing badge on their heads a leaden image of the Virgin Mary. They advocated liberty, equality and the abolition of all civil government. Hugo, bishop of Auxerre, was compelled to use military force to suppress them.

CAPYBARA, kä-pē-bä'ra, an aquatic rodent (*Hydrochoerus capybara*), of the family *Caviidæ*, native to South America. It is the largest rodent known, being four feet long, and weighing nearly 100 pounds. It has a rough brown coat, a heavy flat head, small pig-like eyes and ears, and a blunt muzzle. Its feet are supplied with hoof-like claws, and its tail, unlike that of most rodents, is very short. The animal is herbivorous, browsing on grass along river banks, and often creating havoc in sugar plantations. It is awkward on land, but swims and dives well, and can remain under water a long time. The flesh is edible, except that of very old males. It is known throughout Spanish South America as carpincho, but is called water hog and water horse in British Guiana. Consult ‘Proceedings of Zoological Society of London’ (1894).

CARABAO, kä-ra-bä'ō, a small variety of water buffalo (*B. Bubalus*) found in the Philippines. See Buffalo.

CAR BUILDING INDUSTRY. The memory of men still living is sufficiently elastic to stretch back to the beginnings of steam railroads in this country, and to comprehend the various changes by which the modern railway has become a highly organized and elaborately equipped mechanism. We borrowed the railway from England, but developed it on our own lines. The invention of the locomotive at first simply furnished a mechanical power to transport freight in cars that had formerly been hauled by horses. Tramways were in use in the Hungarian mines during the 16th century; and Ralph Allen's English stone-car of 1734, with its flanged wheels and its hand-brake, is clearly the forerunner of the freight-cars of to-day.

The term "railway" was invented in 1775, when it was first used in Smeaton's reports on English transportation, a quarter of a century before steam was applied to locomotion. Thanks to the recent researches of Mr. Clement E. Stretton, we now know that the first persons ever conveyed by a locomotive on rails traveled, on 24 Feb. 1804, behind Trevethick's locomotive on the Pennydarran cast-iron plate-way or tram-road to Merthyr-Tydvil, in Wales, a distance of nine miles. In order to transport long bars of iron and timber, the cars were made in pairs, coupled together by an iron draw-bar having a joint at either end. The cars had no sides, but in the middle of each was fixed a centre-pin upon which worked a cross-beam or bolster, and upon this cross-beam the timber or bars of iron were placed. On the occasion referred to the trucks were loaded with 10 tons of iron bars, and 70 persons stood on the iron. Here we have the origin of the bogie or truck, the invention of which has been claimed for this country, as we shall see hereafter. Also the capacity of the freight-car, fixed at the beginning at 10 tons, remained at that figure for half a century or more.

In 1812 John Blenkinsop of Leeds had a private car built to carry himself and his managers to his Middleton colliery, while the workmen rode on the coal-cars. On 27 July 1814, George Stephenson's first locomotive, Blucher, drew over the Kenilworth colliery line a passenger-car made by placing the body of Lord Ravensworth's four-in-hand coach on a wooden frame fitted with flanged wheels. This car was used for 20 years. On 27 Sept. 1825, the Stockton & Darlington Railway was opened, and trains of coal-cars were run, with one passenger-coach named the *Experiment*. This was the first passenger-car to be run regularly for the use of the public. It was placed on four wheels, and had a door at each end, with a row of seats along either side and a long deal table in the centre. This car was operated 10 days, until the novelty was worn off; and then the faster stage-coaches carried the passengers. It was not until 15 Sept. 1830 that the Liverpool & Manchester Railway opened its line with a train carrying 600 passengers, and immediately thereafter began to run the first regular passenger-trains.

It is a striking fact in the history of car construction that the English invented both the truck and the long passenger-car with the door at each end; and that these forms, once invented, were almost immediately discarded in England, so that it was left for this country to reinvent them and to make them the distinguishing features of American car building as contrasted with English construction. Indeed, it has been with great reluctance that we have ceased to claim them as original discoveries.

The fact that passenger trains, by displacing stages, threw out of use many of those vehicles, coupled with the other fact that the stage owners, submitting to the inevitable, often became railroad promoters, furnishes a reason why the early masters of transportation both used the stage-coach body as a matter of economy, and also built their new cars on the model in which the conveniences of travel had been most highly developed. The first passenger-coach used in Pennsylvania in 1832 was a stage-coach slightly enlarged. To be sure, the early prints show that in 1830 Peter Cooper's first locomotive hauled an open boat-shaped car from Baltimore to Ellicott's Mills, on the Baltimore & Ohio Railroad; but this model must have been adopted for economy's sake, because in 1833 that railroad placed in service the *Ohio*, a car, stage-coach in shape, with seats on top as well as inside.

As president Mendes Cohen well observed in his address before the American Society of Civil Engineers in 1892, the first important modifications in car-building were called forth by the speed developed in the locomotive. Naturally the wheels first demanded attention. The names of four men are connected with early wheel improvement. Mr. Knight improved the shape of the tread and flange; John Edgar and Ross Winans developed the chilled features; and Phineas Davis further improved and perfected the wheel by altering the disposition of the metal in the tread and the angle of the flange, and by introducing within the cast-iron wheel a wrought-iron ring of five-eighths or three-quarters of an inch round iron both permitted the chill and added strength to the wheel. Mr. Winans' shops turned out thousands of these wheels for use not only in this country, but also in Germany and Switzerland. From 30,000 to 50,000 miles represented the capabilities of a Winans wheel.

With increased speed came the need for increased steadiness, and it occurred to Ross Winans that by adopting the device of the bogie, or swiveling truck used in the transportation of freight, he could build an easy-riding passenger-car. A bogie-truck is a pair of wheels, or more commonly two pairs of wheels, connected by a framework, and having a very strong vertical central king-pin, on which one end of a locomotive or railway car is supported. The device facilitates rounding the curves of a railway track. In 1833 Mr. Winans constructed three long houses on wheels, each capable of seating 60 passengers. Having patented his invention, he was confronted by the fact that the principle he had used was one that had been utilized frequently on tramways, and finally the courts annulled the patent.

We now konw that prior to 1830 England had three bogie-engines at work; that in 1831 Stephenson's John Bull, built for the Camden & Amboy road, was made into a bogie after it reached this country; that Horatio Allen used a bogie-engine on the South Carolina Railroad in 1832, the same year in which the bogie-locomotive *Experiment* was built for the Mohawk & Hudson Railroad. Moreover, the bogie principle was patented in England in 1812. Yet it is certain that the American passenger-car of to-day originated with the three passenger-coaches built in Ross Winans' shops in 1833. England discarded the bogie principle for engines in 1830, and did not return to it until 1876; and that country to this day has not adopted the bogie for passenger- or freight-cars. In 1889, the Paris, Lyons & Mediterranean Railway adopted the bogie for certain passenger-cars; and in 1895 the Great Western Railway of England began to experiment with the bogie-truck. In America the Winans passenger-coach almost immediately supplanted everywhere the stage-coach form, which England still retains in a modified shape, excepting only on the Pullman cars, introduced into that country in 1874. With us not only the passenger-cars, but the baggage, mail and freight-cars, all were placed on swiveling trucks.

That the early railroads of this country were designed to carry passengers rather than freight is to be seen by their reports. The Baltimore & Ohio road, from 1 Jan. 1831 to 1 October carried over its 13 miles of track 5,931 tons of freight and 81,905 passengers; and so late as 1839 the Camden & Amboy carried only 13,520 tons of merchandise as against 181,479 passengers. In fact, the railways as freight carriers could not compete with the canals, which in those days were the traffic routes. In 1831 the Tuscarora & Port Carbon Railroad could not meet canal rates by 39¼ cents per ton, the railway charges being 40 cents, plus a toll of 15 cents per ton, while the canal rates were 10¾ cents, plus 5 cents toll.

Mr. John Kirby, describing from memory the freight-car of 1848, says that it was the same square box it is to-day; its capacity was from 6 to 10 tons; the roof was covered with cotton duck painted and sanded. The hot sun cracked this covering and let the water in on the freight, an annoyance common also to passenger-coaches of that day. Few freight-cars were used in New York State at that date, the Erie Canal being sufficient for summer freight. Wood was the universal fuel, so there was no coal transportation. Wooden brakeheads were used, and it required three men to turn the screw that pressed the wheels on and off the axles. The ripping of planks was done by hand, as was also the dressing up; and when one man had tools to grind, a fellow-workman turned the stone. Carpenters and car builders of six years' experience commanded $1.12½ a day wages.

Viewed from the standpoint of to-day, the passenger-car of the early fifties, built at a cost of about $2,000, was a combination of inconveniences. The cast-iron stove in the centre of the car broiled those who sat immediately around it, while the unfortunates one seat removed from its satanic glare shivered and froze. In summer the dust was intolerable, and, notwithstanding elaborate devices for ventilation, the dust problem did not begin to be solved before the appearance of the monitor roof or clearstory in 1860. Hot-water heating and the abolition of the deadly car-stove came with the Pullmans.

In 1856 Capt. (later Sir) Douglas Galton, of the Royal Engineers, was sent to America to investigate our railways. His report to the lords of the Privy Council for Trade gives a straightforward and unbiased account of his investigations. Perhaps there is extant no other report which so comprehensively discusses the railway situation in the United States about that date.

"The practice of constructing railways [in America] in a hasty and imperfect manner," says Captain Galton, "has led to the adoption of a form of rolling stock capable of adapting itself to the inequalities of the road; it is also constructed on the principle of diminishing the useless weight carried in a train. The principle is that the body of the car is carried on two four-wheeled trucks, to which the body is attached by means of a pintle in the centre, the weight resting on small rollers at each side. The framing of the truck is supported on springs resting on the axles, and the pintle and rollers are fixed to a cross-beam which is attached by springs to the main framing; so that between the body of the car and the axles are a double set of springs. India-rubber springs are in general use, but they often become hard; consequently sometimes steel springs are used, with great advantage. Any side movement which might result from the slight play allowed to the cross-beam is counteracted by springs placed between its ends and the framing. An iron hoop attached to the framing passes under the axle on each side, so as to support the axle in case it should break."

The bearings Captain Galton found not unlike those used in England, but the use of oil as a lubricator was novel. He was told that under favorable circumstances the oil in an axle-box needed to be renewed but once a month; but that it was difficult to obtain good oil. The wheels were of cast-iron, with chilled tires; they were from 30 to 36 inches in diameter, weighed rather more than 500 pounds and were without spokes. When made by the best makers they would run from 60,000 to 80,000 miles before the tires were worn, and they cost from $14.50 to $17.00 each. The iron used in making wheels was of very superior quality; and so great was the practical skill required that but three firms in the United States could be relied on to furnish wheels of the first grade.

The most approved form of draw-bar was continuous under the car, and was attached to the elliptic springs, acting in both directions. The iron shackle was in general use, but some railways preferred an oak shackle 18 inches long, 2 inches thick and 6 inches broad. This block was bound with an iron band divided on each side at the centre, so that a car on leaving the rails would break the shackle transversely.

Already the automatic coupler for freight-cars was prefigured in a device by which the pin in the bumper of one of the cars was supported by means of a ball, so that the shackle of the on-coming car pushed back this ball and let the pin fall into its place. All passenger-cars and most freight-cars were supplied with brakes; and the Philadelphia & Reading Railroad was endeavoring to anticipate the day of train-brakes by an invention whereby a sudden check in the speed of the engine applied the brakes to the wheels of all the cars. The toilet, the car-stove and the ice-water tank all had established themselves in the best cars.

On the Illinois Central, between Cairo and Dubuque, some of the cars were filled with compartments in which the backs of seats turned up and so formed two tiers of berths or sofas, for the accommodation of persons who might wish to lie down and were willing to pay for the privilege. The passenger-car had attained a length of 60 feet, though the 30- and 45-foot cars were more common; the baggage-cars, with their compartments for mail and express, were 30 feet long, and the freight-cars from 28 to 30 feet. In those days the freight-cars were constructed more strongly than were the passenger-coaches; a Baltimore & Ohio freight-car 28 feet long, and with a capacity of nine tons, itself weighed six tons.

Of necessity progress in car-building had to wait for the development of the railroads. The original roads were not constructed as through lines between the larger cities, but as the connecting-links between natural waterways, answering to the portages or carrying places of the old days when commerce was conducted in canoes. Often built as the result of local or State enterprise, a short line was sufficient to use up the scanty capital available, or to exhaust the willingness of the people to be taxed for public improvements. The great systems of to-day represent survivals of the fittest early ventures, and development according to environment. Thus the various small roads which traversed the present main line of the New York Central were not consolidated until 1853, and the same year the roads between Philadelphia and Pittsburgh came under one control. So late as 1862 there were five separate companies operating the lines between Lake Erie and Lake Michigan; and as each road had a gauge of its own, it was regarded as a triumph in car construction when freight-cars of compromise gauge were built to run over all five roads. In 1869, however, the Lake Shore & Michigan Southern lines came under a single head.

When in October 1865 a combination was formed among eight railroads to establish a fast freight line between New York and Boston and Chicago, the maximum difference in the gauges of the several lines was one inch; and this was compensated for by a broad tread wheel. Each company contributed a number of cars proportionate to its mileage, one car for every three (afterward increased to one for every two) miles. In 1865 the quota of the Lake Shore & Northern Indiana was 179 cars; while in 1894 that road's quota of Red Line cars was 2,200.

In 1862 the United States government conducted the greatest railroad business known up to that time. With headquarters at Nashville, the government operated 1,500 miles of road with 18,000 men, whose monthly wages amounted to $2,200,000. The rolling stock consisted of 271 engines and 3,000 cars. No entirely new locomotives were built, but the 3,000 men employed in the locomotive repair shops pieced out fully equipped engines founded on a serviceable boiler or a pair of sound driving-wheels. Among the triumphs of the national car-shops were, first, a headquarters car for General Thomas, the car being 50 feet long, iron-plated, and provided with a kitchen, a dining-room, a sleeping apartment and an office; and, secondly, the hospital trains, in which the jars and jolts were reduced to a minimum. It was during the year 1864 that General McCallum and Colonel Wyman came to Detroit and summoned the managers of the Michigan Car Company to stop all building then in progress and to work solely for the government. They gave a contract for a number of box- and flat-cars to be operated on Southern roads; and inasmuch as the gauge differed from that of the Northern roads, the new cars were loaded on flat-cars and sent to Cincinnati. The government officials fixed the price of the cars and made payment in certificates, some of which the company exchanged for materials, and the remainder were held until money could be obtained for them.

The enormous transportation business developed by the war, together with the labor conditions and the paper-money issues, combined to raise the price of cars; so that the standard freight-car of 1864, a car 28 feet long and with a capacity of 10 tons, cost $1,000 or more. About 30 years later a car 34 feet long, with a capacity of 30 tons, and provided with automatic couplers, air-brakes and other improvements, could be purchased for about $500.

When the war ended the managers of railways were called on to face a heavy decline in both freight and passenger traffic, due to the disbanding of the armies. Money was not plentiful, cars were very expensive and the mania for extending lines into new territory had begun. Under these conditions the roads began a system of borrowing cars from the builders or from car-trust companies. The Michigan Car Company was probably the first to make contracts on a car-loaning basis; be that as it may, this company had at one time loaned to railroads between 6,000 and 7,000 cars, payment being made according to the car's mileage. With better times and better credit the roads began to buy cars for cash or on long time, as was most convenient; and loaning freight-cars to railroads on a mileage basis was practically discontinued. A majority of the refrigerator-cars, however, continued to be owned by private parties and run on a mileage basis. The reduction in the mileage rate practically killed the business of private ownership, since the new rate did not much more than pay for the repairs.

In the winter of 1868–69 the first Westinghouse air-brake was used on the Steubenville accommodation train running on the Pittsburgh, Cincinnati & Saint Louis Railroad. The Pennsylvania road adopted it, and since the automatic feature was added, in 1873, it has come into almost universal use on passenger-trains, while by far the larger proportion of new freight-cars built are equipped with it. In 1887 a train of 50 freight-cars made a triumphal tour of the great lines, and by repeated tests, under varying conditions, proved that the Westinghouse brake can stop a train in one-tenth the space required by the hand-brake. In 1867 Colonel Miller placed his patent platform, buffer, and coupler on three cars building in the shops at Adrian, Mich.; and with great rapidity the dangerous old platform, with its loose link coupling, disappeared. In 1860 the Post-Office Department began to demand more room from the railroad companies, and year by year the mail-cars were increased from 17 to 20 feet in length, then to 35, and finally to 60 feet.

The interchange of cars among the various roads made it necessary to adopt standards in car construction, in order to facilitate repairs to cars when away from the home road. Some authority, too, was needed to settle disputes between roads, arising from charges for repairs; to investigate new brakes and couplers; and, in general, to keep the work of construction fully abreast of the times. The Master Car Builders' Association, organized in 1867, amply fills this need; and the reports of its annual meetings contain the latest word on all subjects relating to car-building. Its arbitration committee also acts as a court of conciliation for the various roads.

Car-building has undergone a revolution during the past 25 years, due in part to increased demands on the railways, and in part to improved methods of construction. The use of wood as a material is markedly less, and the use of steel is steadily increasing, so that both passenger and freight cars of recent date seem to be of better and more durable type than ever before. Modern cars are a development, built for service and long life, and to meet the numerous demands of shippers and the traveling public. The parlor car has developed into an entire series of sumptuous apartments on wheels built to transport those who want comfort and luxury in their journeyings, and are willing to pay for them; the difference in the needs of the commuters around a large city and of passengers going long distances has called for a differentiation in passenger cars. For express and mail service there has been developed a line of cars that enable business to be properly handled en route, avoiding delays at terminals. For freight transportation there have been put into use literally hundreds of styles of cars, adapted to convenient carrying of special goods of widely varying nature.

Passenger Cars.— The standard passenger car is termed a day coach, and is 78 feet long, 10 wide and 14½ high; it weighs 112,000 pounds, is practically all steel, and has 40 double seats, automatic windows, racks for coats, grips, etc., a toilet, ice-water supply, Pintsch gas or electric lights and minor conveniences. If for through traffic it has a vestibule, so that passengers can walk from car to car without exposure to the weather. The construction cost is about $10,000. For suburban service, non-vestibuled cars are used, and many have cane-covered seats that do not hold the dust. There were 53,500 passenger cars in use on the steam railways of the United States in 1915, or about one car to five miles of tracks.

A cheaper grade of passenger car is known as the emigrant or tourist car, equivalent to the second-class car of Europe. Many companies use their older wooden cars for this service, but the cars built for this traffic are simply a cheap grade of car, with usually cane-covered seats, fewer conveniences and slight decoration.

The standard sleeping car is 72½ feet long, of all-steel construction, has 24 berths and weighs 152,000 pounds. It is increasingly common to build them with two to a dozen separate compartments, like state-rooms on a steamboat, each compartment having two to four berths and toilet conveniences. Some sleepers are built with several compartments and the remainder of the car constructed as a parlor and observation compartment, so that a party or small number of passengers can have the conveniences of both bedrooms and drawing-room. The form of sleeper that is alterable to a day coach, the berths folding away, appears to be less popular than formerly.

Observation cars, with extra large windows, and often with individual seats, have come into considerable use in transcontinental travel. The term parlor car is now used by the railways for a day coach, handsomely fitted up with individual chairs, and for which an extra charge is made. Sometimes these are called chair cars. The terms palace car and drawing-room car are going into disuse.

Smoking cars are run on practically all passenger trains, and have usually imitation leather covered seats. Sometimes they are provided with card tables. The cafe car is not only a smoker, but card-room and bar-room combined — a high-class café or saloon on wheels. The dining car is fitted up with a kitchen, and the passengers are expected to come in to the tables to take their meals, or sometimes the service is extended through the train. The buffet car is fitted up for a simpler class of meals and a less extended menu than the dining car.

The business car is a recent innovation, having tables, desks and stationery for correspondence; also typists and stenographers in attendance. The private car, built for railway officials and people who wish to travel in luxurious seclusion, is fitted up as a living suite of rooms, with hotel conveniences and elegant appointments.

Sleeping Car.— Improved railway travel may be said to date from 1836, when the first sleeping car was offered to the traveling public. In that year the Cumberland Valley Railroad of Pennsylvania installed a sleeping-car service between Harrisburg and Chambersburg. This first sleeping car was an adaptation of an ordinary day coach to sleeping requirements. It was divided into four compartments in each of which three bunks were built against one side of the car, and in the rear of the car were provided a towel, basin and water. No bed clothes were furnished and the weary passengers fully dressed reclined on rough mattresses with their overcoats or shawls drawn over them. Candles furnished the light, and the heat was supplied by box stoves burning wood or sometimes coal. Other similar cars were adopted soon after by various railroads and for a number of years these cars found an appreciative patronage, and temporarily served the patrons of the railroads. Improvements were negligible and the only justification for such cars existed in the ability of the passengers to recline at length during the long night hours. The first fundamental improvement came in 1858 when George Mortimer Pullman put several revolutionizing ideas to practical test by remodelling two Chicago and Alton coaches into sleeping cars. In these Mr. Pullman introduced his invention of upper berth construction by means of which the upper berth might be closed in the day time and also serve as a receptacle for bedding. Other improvements were worked out and tested, and from these first experiments were drawn the plans from which the first cars entirely constructed by him were made. These cars were popular with the traveling public but in 1864 Mr. Pullman put in service a model car, entirely built according to his own ideas, at the then unprecedented cost of $18,000. This car, named the *Pioneer,* had improved truck springs reinforced by blocks of solid rubber; it was a foot wider and two and a half feet higher than any car then in service. Other cars of the same type were soon put in service and were universally admired. Within a comparatively short period railroads adopted new and superior accommodations at the popular demand for the increased comfort and safety offered by the new type of sleeping cars. Various companies began the building of sleeping and parlor cars in competition with the Pullman Company, incorporated in 1867. The Gates Sleeping Car Company and the Wagner Palace Car Company were for a time serious competitors and from 1870 to 1890 the Wagner and Pullman companies were the strongest in the field. Through the control of better patents and in course of competition the Pullman Company soon became the only important sleeping-car company in the United States. Its business grew rapidly and now it builds and operates sleeping cars throughout the United States, Canada and Mexico on all important lines, and also builds other types of cars, both freight and express, for Europe, South America and England. A few railway companies operate their own sleeping cars. The general arrangement between the Pullman Company and the railroad companies, over whose lines it operates its cars, differs widely as between different companies. Where the average number of passengers traveling in Pullman cars per car mile is very high, as it is on the line between Boston and New York, the Pullman Company pays the railway company something for carrying the car on its trains. Where the passenger traffic in Pullman cars per car mile is very light the railway company pays a rental to the Pullman Company for its cars. The Pullman service has kept in advance in service and efficiency of all its competitors. Its standard has always been high. It was a pioneer in installing electric lighting and steam heating systems in its cars and many other devices tending to increased comfort and safety have been adopted and it is ever ready to adopt new ideas in the construction and equipment of its cars. Its service is superior to that on railways which operate their own sleeping cars. Its cars are now constructed entirely of steel and are especially designed to secure the safety and comfort of passengers. Their rates were found to be entirely reasonable after an exhaustive investigation by the Interstate Commerce Commission in 1910. To-day the Pullman Company operates 7,500 cars over 137 railways, or a total of 223,489 miles of track. To operate these cars over 10,000 car employees are required, while 7,000 more are employed to keep the cars in repair, and maintain them in a clean and sanitary condition.

Baggage and Combination Cars.—The railways define a baggage car as one built for carrying trunks and passengers' baggage and having large side doors. There are usually end doors and a few windows. Where trains have short runs and consequently light demands for baggage, it is common to combine the smoker and baggage car in one, with a bulkhead dividing the compartments. Sometimes the baggage and mail are combined in a similar way, and a few cars are made with three compartments, for baggage, mail and smoking. Baggage compartments are also sometimes built as parts of regular passenger cars.

Freight Cars.— There were 2,500,000 freight cars in service on the steam railways of the United States in 1917, and about 125,000 new cars of this class are being built annually. This is only a small increase in number, but the increase in carrying capacity is probably 6 to 8 per cent, owing to the larger size of the modern-built cars. Much of the recent construction is pressed steel, that is, soft steel plates for the car-bodies, sheared to size at the rolling mill, and pressed into form and riveted and bolted together. The larger steel plates of simple form are cold-pressed, those of intricate form and small parts are mostly hot-pressed. The bolsters and framework of the trucks are also now mostly made of steel by machine forging, the tie-rods and attachments are mostly steel and the wheels are either iron or steel. The notion that some car-wheels are of paper is a pleasing fiction, originating with some newspaper reporter. Its only basis is the use of paper in compound wheels placed between the two parts of a car-wheel to deaden the "ringing" or noise of vibration. These all-steel cars involve higher first cost than the wooden cars, but being made in larger sizes and having much greater life, are coming more and more into use. The typical old-fashioned wooden box car is 40 feet long, 8 feet 10 inches wide and 8 feet high, weighs 36,000 pounds and cost, before the war, $1,300, having a carrying capacity of 60,000 pounds. The all-steel cars are built of capacities ranging from 80,000 to 120,000 pounds.

Box cars are ventilated when designed for carrying food stuffs and double-walled or insulated for fruit transportation. When provided with icing conveniences they are termed refrigerator cars, and are specially built for carrying meat, beer, produce, etc. Stock cars are built with stalls for horses and cattle and pens for sheep, swine or poultry. Flat cars are the cheapest railway cars, many of them costing not more than $800. They consist simply of the running gear, that is, a pair of trucks, with a deck and brakes. Keepers are inserted in the sides of the deck in which uprights can be inserted to keep the load from falling off. They are used for carrying stone, ore, lumber, glass, ordnance and any heavy freight that will bear exposure to the weather. When provided with low sides they are termed gondolas, and may be used for conveying coal, coke, etc. Hopper cars are built with slanting bottoms and gates below, so that the contents can be discharged by opening the gates; two hoppers to a car is a common construction. Dump-cars usually are arranged to tip sideways so as to slide off the load. These are used for conveying earth, gravel and ballast for road filling. Tank cars are built for oil, acids and other fluids that have to be handled in large quantities, and they are usually cylindrical in form.

Special Service Cars.— The steam railways of the United States have in service 125,000 cars designed for their own use, a number twice as great as the total of passenger cars. Perhaps the most familiar of these to the public is the freight caboose, seen on the tail end of railway trains, and serving to house the crew and carry their tools and supplies. There are repair cars with a general equipment of tools — traveling machine shops. Wrecking cars are supplied with very heavy and powerful cranes for lifting wrecked cars or locomotives that have left the track. Every railway has to keep them at convenient points for use in case of accident, but they also have their uses in construction work. Steam-shovel cars are utilized to dig sand and gravel from banks, and pile-driver cars for construction in boggy places. There are ditching cars for excavating, track-layer cars and an entire series of other special cars used for modern scientific railway construction and repair work. The snow-removal car plows, some of which have great rotating heads, are among those most readily noted by the public.

The smallest of all railway cars is the push-car, made of two pairs of wheels and a slight deck, designed for the convenience of track-workers. Next comes the handcar, with a hand lever connected by a crank to the wheels. A few active men can operate one for a short distance at almost railway speed. A new form of inspection car is an improvement on the handcar, having a small gasoline engine for working the lever.

Street Railway Cars.— Since power was applied to street railway cars they have increased in size and developed along lines similar to steam railway practice. The earlier electric cars were short and mounted on a single truck. As traffic developed the two-truck car came in, and is now the accepted type. Open cars with cross seats and a running board are favored for summer traffic, but the standard car has seats of railway pattern, the tendency being to substitute reversible seats for two persons in place of longitudinal side seats. The front and rear platforms are now generally enclosed, to protect the motorman and conductor from the weather. Electric light and heat are commonly supplied, though in some the car-stove burning coal is still in use. Since 1910, the «pay as you enter» type of car has become popular with the companies and passengers are detained in a rear vestibule until they have deposited their fares in a box.

For subways, all-steel car construction is preferred, and in some cases is obligatory by law. These cars have both side and end doors, for the quick transfer of passengers. Elevated electric railway cars for city traffic follow closely the lines of development of steam passenger cars, but are of lighter construction.

Features of Construction.— The typical modern railway car is the day coach. It has spokeless wheels of either cast iron, wrought iron or cast steel, with a steel tire shrunk on. The wheels are fixed solid on the axles in pairs, and two pairs of wheels form a truck, though eight-wheeled trucks have been built. The body of the car rests on and is fixed to each truck by a central pin on which it turns. There are rolls and springs for steadying the car and preventing jolting. Between the trucks, under the deck, is located the air-brake, consisting of a reservoir of compressed air, a brake-cylinder and connections. (See AIR-BRAKE). Cars are provided with couplers at the end of the car-deck and automatic couplers are now generally in use, which hook the cars together when gently bumped. The car roof has a raised central section called the clear-story, in which ventilators are placed, so that air circulation may be maintained without drafts. The car-seats have been the subject of hundreds of patents, but the accepted form is now a metal framed seat for two, with double levers for reversing the back, which is ordinarily high. Both seat and back are cushioned, most commonly covered with plush. See RAILWAY.

Statistics.— There are 110 establishments in the United States manufacturing strictly railway cars. The American Car and Foundry Company and the Pressed Steel Car Company are the largest, but a large business is done by the Southern Car and Foundry Company, Standard Steel Car Company, the Pullman Company, Haskell & Barker Car Company and Western Steel Car and Foundry Company. Each railway has its own repair shops and many of these make cars, their output being about 15 per cent of the total production. In addition, a number of foundries and machine works make some cars as a side line, their production being about 9 per cent of the total. All these shops have a total capacity of nearly 300,000 cars a year, but rarely have more than 125,000 been made in a year. In 1909 the production was 101,243 cars, of which 1,601 were passenger, and 603 were for electrical use on trunk line terminals, and 2,089 were for street railways. It is estimated that there are in use now (1917) 2,800,000 cars of all sorts on the trunk line railways of the United States.

Railway cars are made by so many different concerns that are also engaged in other manufacturing that it is impossible to state with accuracy the capital invested in the business. The total manufacture, while given as 135,000, valued at $165,000,000 in the 1914 census, is really much higher, because the large railways all maintain very large repair shops, and often cars are made of two-thirds new and classed as «repairs.» These repair shops in 1914 added a value of $243,000,000 to the rolling stock of the United States railways. Pennsylvania is the leading State in the steam-car building industry, with $93,600,000 production in 1914; Illinois was next with $41,496,000, Ohio third with $33,286,000; and New York produced $30,893,000. Indiana and California follow, but in other States the production is small.

CHARLES H. COCHRANE,
Author of 'Modern Industrial Progress.'

CARABAS, Marquis of, the exalted personage who figures in Perrault's story of 'Le Chat Botté' ('Puss in Boots'). The name is often applied to an extremely conservative aristocrat. In Disraeli's 'Vivian Grey' the Marquis of Clanricarde is satirized as the Marquis of Carabas.

CARABIDÆ, the family of *Coleoptera*, comprising the ground-beetles. See GROUND BEETLES.

CARABINE, or CARBINE. See SMALL ARMS.

CARABOBO, a state of Venezuela, bounded on the north by the Caribbean Sea; area, 2,984 square miles. The capital is Valencia, and the chief port Puerto Cabello. Coffee, cacao and sugar are cultivated. The village of Carabobo, 20 miles southwest of Valencia, was the scene of the battle fought 24 June 1821, which was decisive of the independence of Colombia.

CARACAL, a lynx-like wild cat of Africa and southern Asia, slender in form and usually red-brown in color. See Lynx.

CARACALLA, Roman emperor: b. Lyons 188 A.D.; d. 217. His real name was Marcus Aurelius Antoninus Bassianus, and he was the eldest son of Septimius Severus. He accompanied his father on his expeditions, notably to Britain; and on the death of his father he succeeded to the throne with his brother, Antoninus Geta, whom he speedily murdered. To effect his own security upward of 20,000 other victims were butchered. In 212 he gave citizenship to all free inhabitants of the empire, his motive being to increase revenue from the taxes on inheritances. His reign as sole emperor was occupied largely with military campaigns. Among the buildings of Caracalla in Rome the baths — *Thermæ Caracallæ* — near Porta Capena, were most celebrated, and their ruins are still magnificent. He was himself assassinated by Macrinus, the pretorian prefect, near Edessa, in 217.

CARACARA, a genus of large carrion-eating hawks of the tropical parts of America, with black and white plumage, the head somewhat crested, legs long and naked, and the general aspect vulture-like. They have increased greatly with the spread of the cattle-raising industry in South America, and have proved of much service as scavengers about the ranches and villages. They erect nests of sticks in trees or cliffs and lay only two eggs, heavily blotched and spotted. The species to which the name most strictly applies is *Polyborus cheriway,* which is found from Venezuela to Texas and southern California. Another prominent species is the carancho (*P. tharus*), numerous and well known all over Brazil and Argentina. Compare Chimango. Consult Sclater and Hudson, ‘Argentine Ornithology’ (Vol. II, London 1889); Darwin, ‘A Naturalist's Voyage’ (London 1860).

CARACAS, Venezuela, city and capital of the United States of Venezuela, was founded in 1567 by Diego de Lazada, who called the city Santiago de León. But in popular usage a more distinctive name was adopted — that of the Caracas tribe of Indians, formerly inhabiting the valley in which the city is built. It was twice destroyed — in 1595, when it was sacked by the English, under Preston, and in 1766, when the French put it to sack and pillage. But it continued to grow, and played an important part in the war of independence against Spain, claiming the honor of having been the first colony in South America that succeeded in throwing off the yoke of Spain. Caracas was the birthplace of Simón Bolivar. The great earthquake of 1812 killed 12,000 persons and laid half the city in ruins. The last serious shock occurred in 1900. Its altitude being about 3,000 feet above sea-level, the climate is generally mild and agreeable, the temperature seldom rising above 82° F. (with 84.2 as a maximum), or falling below 65° F. (with a minimum of 48.2). Toward the end of December the temperature is lowest, and it is highest from June to September. Mean temperature, 66.2° F., lat. 10° 32′ N., long. 67° 4′ 45″ W. The streets cross each other at right angles, running due east and west, or north and south, and the principal thoroughfares are paved with stone, and have sidewalks of cement. The capitol building occupies an entire square, an area of more than two acres. It includes the halls in which both chambers of the national Congress hold their sessions. The rooms of the High Federal Court and the Departments of Public Instruction and the Interior are in the galleries on the east and west sides of the capitol. *La Casa Amarilla* (the Yellow House), official residence of the President of the republic, is situated west of the Plaza Bolivar. On the north side of the same square is the main post-office. Near-by are the archbishop's palace, the cathedral and the municipal palace. Opposite the southern façade of the capitol are the university buildings (Gothic architecture, with interior gardens); the old temple of San Francisco and the Exposition Palace, the western wing of which contains the Bolivar Museum, the headquarters of the Academy of History, and the corresponding branch of the Spanish Royal Academy. The national library and museum are housed by the university. Other characteristic buildings are: The National Pantheon, the Masonic Temple, the three markets, the National Benevolent Institute, the Arsenal, the Institute of Arts and Trades and the Municipal Theatre. Besides the Plaza Bolivar, the principal public squares are the Washington, Pantheon and Fifth of July (Independence Day). The cathedral, dating from 1614, the Basilica de Santa Ana, and the Santa Capilla, are noteworthy among the churches of the city. Interesting relics of the heroes of the struggle for liberty, Miranda, Bolivar and Páez, are shown in the National Museum. There are several promenades (called «Iron Bridge,» «Paradise Avenue» and «Independence») and among the places of amusement are a Plaza de Toros, baseball grounds and a bicycle park. An important institution supported by the government is the Vargas Hospital. The Linares Hospital for children is maintained by private contributions. Leading clubs are the Union, German, Italian and Agricultural. Caracas does little manufacturing but is the centre of the export trade of the district, which produces cacao, coffee, tobacco, etc. Street railways are controlled by the Caracas and Bolivar companies. The city has cheap telephone service, furnished by two companies, and is lighted by gas and electricity. All telegraph lines throughout the republic are owned by the government. Four lines of railway start at Caracas, three of which are designed to place the capital in communication with the interior, while the most important runs to Port La Guayra. Pop. including the six suburban parishes making up the Federal district is about 90,000.

CARACCIOLI, kā-rā-chō'lō, **Francesco,** Italian admiral: b. Naples 1752; d. 29 June 1799. He was distinguished in the Neapolitan service, but entered the service of the Parthenopean Republic set up by the French republicans in 1799, and repelled a Sicilian-English fleet. When Ruffo took Naples, Caraccioli was arrested, and being tried by court-martial was condemned to death, and hanged at the yard-arm of a Neapolitan frigate. His corpse was thrown into the sea. The court-martial was ordered by Nelson, to whom the King had given command of the Neapolitan navy. Nelson is said to have been influenced in his decision by the notorious Lady Hamilton.

CARACTACUS, British king. He was a son of Cunobelin, King of the Trinovantes, and in 43 A.D., when Plautius landed, was at the head of the Catuvellauni. Plautius and his lieutenant, Vespasian, who afterward became emperor, defeated the British forces under Caractacus on several occasions, the chief battle probably taking place about Wallingford. When the Romans had pushed well down the Thames the Emperor Claudius arrived and took part in further military operations, but his stay was a very short one. Caractacus now established himself in South Wales among the Silures, whence he took every opportunity of harassing the Romans. In 47 A.D. Plautius was replaced by Ostorius Scapula, and that commander completely defeated Caractacus in a battle somewhere about Shropshire, probably at Caer Caradoc. The wife, daughter and brothers of the British leader were captured, and Caractacus himself fled to the country of the Brigantes in the north, only to be delivered up by their Queen, Cartimandua, into the hands of the Romans. He was taken to Rome and made to take part in a triumphal procession. Here he was led before the Emperor Claudius and an assembly of the people. According to Tacitus ('Annales,' book XII, chapter XXXVII) when he came to the seat of the Emperor he stopped and addressed him, and so won upon the monarch by his noble behavior and pathetic speech that the other pardoned him. According to the Welsh Triads he lived four years longer, and his children became Christians and introduced Christianity into Britain. He is introduced among the dramatis personæ of Beaumont and Fletcher's play, 'Bonduca.'

CARADOC GROUP. See Bala Beds.

CARADOC SANDSTONE, the name given by Murchison to a thickness of about 4,500 feet of sandstones, shales, grits, flags and sandy limestones on the border between England and Wales, which he made a separate series. Subsequent investigation has shown that the Caradoc series is of the same age as the Bala, and the series is sometimes called Bala and Caradoc by English geologists. The Caradoc and Bala beds are fossiliferous and have been used largely as the basis of comparison in geological study. The rocks are of the uppermost division of the Ordovician system of England. See Ordovician.

CARAFE, kă-raf', the French name for an ordinary glass bottle or decanter for holding drinking water.

CARAFFA, a celebrated Neapolitan family, which has produced several distinguished commanders and statesmen: 1. Oliviero, b. 1406; d. Rome 1511. He was made a cardinal by Pope Paul II in 1467. Sixtus IV appointed him his legate to Alfonso of Naples, and in 1472 made him admiral of his fleet against the Turks, from whom he captured Smyrna, and the port of Satalia in Asia Minor. 2. Carlo, b. Naples 1517; d. 1561. He served first in the Netherlands under the Spaniards, then entered the order of Malta, and was made a cardinal by his uncle Pope Paul IV, who, for his sake, stripped the Colonnas of their possessions. This involved them in a war with Philip of Spain, but the result proved favorable to the Caraffa family. Paul IV who succeeded Pius IV appointed a commission of eight cardinals who tried Carlo and on 3 March 1561 put him to death for high treason. 3. Antonio, b. Naples 1538; d. 1591. He was made cardinal by Pius V, and entrusted with the superintendence of the congregation for the revision of the Bible, and an exposition of the canons of the Council of Trent. Under Gregory XIII he became librarian of the Vatican. He translated Theodoret's Commentaries on the Psalms, and the Orations of Gregory Nazianzus from Greek into Latin. 4. Antonio, another member of the family, distinguished himself in Hungary in the service of Austria, but made himself universally hated by his cruelty; d. Vienna 1693.

CARAMBOLA, the fruit of an East Indian tree of the same genus as the bilimbi, the *Averrhoa Carambola,* order *Oxalidaceæ.* It is of the size and shape of a duck's egg, of an agreeable acidulous flavor. The rind is yellow and smooth with five longitudinal ribs. In British India it is used for flavoring sherbets, tarts, etc., and is known as the caromandel gooseberry. The leaves are characterized by an extreme irritability and a tendency to display the phenomenon of sleep in plants.

CARAMEL. When sugar is gradually heated, it loses water and other substances, and is converted into a dark mass with a characteristic smell and taste. All materials containing sugar form the same substance, such as coffee, malt, chicory. This is crude caramel, which is used in cookery as a coloring and flavoring ingredient. It is a mixture of several bodies, of which three have been described: Caramelane, a brown bitter body, soluble in water; Caramelene, a dark brown body, also soluble in water, and possessed of great tinctorial power; and Caramelin, a black substance, of intense coloring power, which exists both in a soluble and insoluble modification. A kind of brown soft candy is also called caramel.

CARAN D'ACHE, kă'rôn d'äsh' (French for leadpencil), or **POIRE, Emmanuel,** French caricaturist and artist; b. Moscow, Russia, 1858; d. Paris, 26 Feb. 1909. His ambition was to be a military painter, but he is best known for his series of pictorial anecdotes contributed to *La Vie Parisienne, La Caricature, le Figaro illustré, le Chat Noir,* etc. Besides illustrating Bemadaky's 'Prince Kozakokoff' and other celebrated books he published several albums of sketches, the 'Carnet de chèques' depicting the Panama scandals; 'Album de croquis militaires et d'histoire sans légendes'; 'Histoire de Marlborough,' etc. Consult Spielmann, M. H., Introduction to 'Works of Caran d'Ache' (London 1898).

CARANGIDÆ, kă-ran'jĭ-dē, a family of marine fishes, the pompanos. Among the more widely known members of the family are the leather jackets, pilot fishes, amber fishes, runners, horse mackerels, crevallés, moonfishes and pompanos. There are about 200 species in the family, and nearly all are good for food. They abound in the warmer seas, and many of them are remarkable for their graceful or strange forms.

CARAPA, a small genus of tropical trees of the family *Meliaceæ,* with mostly imparipinnate leaves and regular flowers. A South

American species (*C. guianensis*) is a fine large tree, whose bark is in repute as a febrifuge. Oil made from its seeds (called carap-oil or crab-oil) is used for lamps, and masts of ships are made from its trunk. The wood is called crab-wood. The oil of the African species (*C. procera*), called *coondi, kundah or tallicoona* oil, is used by the negroes for making soap and anointing their bodies in order to protect them against insects. The oil of the South American carapa is used for the same purpose also.

CARAPACE, the upper part of the hard shell or case in which reptiles — turtles, tortoises, etc,— belonging to the order of the *Chelonia* are enclosed, the lower part being called plastron. The same name is also given to the upper part of the shell of the *Crustacea,* and to the case enclosing certain of the *Infusoria* (qq.v.).

CARAPEGUA, kä-rä-pä-gwä', Paraguay, interior town 37 miles southeast of Asuncion. Settled in 1785 it is situated in a fertile country, producing cotton, tobacco, corn, sugar cane and manioc. It has modern public buildings, including a church and two schools. Pop. 13,000.

CARAQUET, kä-rä-ket', Canada, port of entry, Gloucester County, New Brunswick, on the Bay of Chaleur and on the Caraquet Railroad. The settlement consists of Upper and Lower Caraquet and is noted for its fisheries. Pop. 4,621.

CARAT, derives its name from *qirrât,* which in Arabic signifies the pod of the *Erythrina abyssinica,* the coral tree of Abyssinia, the seeds of which have, from time immemorial, been used in the East in weighing gold, because they never vary in weight when once dry. It is a weight of three and a sixth troy grains, used in weighing pearls and precious stones, and also serves to express the relative fineness of gold. Twenty-four carats being assumed as the standard of gold perfectly free from alloy, every specimen, in proportion as it falls short of this purity, has a fineness of less than 24 carats — for example, if the alloy amounts to a sixth of the whole, it is 20 carats fine; or to a fourth, it is 18 carats fine.

CARAUSIUS, kä-rô'shĭ-ŭs, Roman general: b. among the Menapii, in Gallia Belgica. He was sent by the Emperor Maximian to defend the Atlantic coasts against the Franks and Saxons; but being suspected of permitting those pirates to commit their ravages in order to increase his own plunder when he afterward captured their vessels, and foreseeing that he was likely to fall into disgrace, he landed in Britain and had himself proclaimed emperor by his legions (287 A.D.). In this province he was able to maintain himself six years by guarding the English Channel with his fleet. He became co-emperor with Diocletian and Maximian in 289; but under Constantine his reign came to an end. Boulogne fell in 293 and in the same year he was assassinated by one of his officers named Allectus. Consult Gibbon, 'Decline and Fall' (Vol. I, chap. XIII, ed. by Bury, with notes, London 1896); Webb, 'The Reign and Coinage of Carausius' (London 1908).

CARAVACA, Spain, town in the province of Murcia, about 40 miles west by north of the town of Murcia. It occupies the side of a hill crowned by an ancient castle and overlooking the river Caravaca, here crossed by a stone bridge; is well built and has a handsome town-house and church, the latter with a lofty tower and some good sculptures and paintings. Its trade is chiefly in cattle, grain and manufactures of woolen and hempen goods, paper, soap, earthen and copper ware, chocolate and oil. Pop. 17,349.

CARAVAGGIO, kä-rä-väd'jō, **Michel-Angelo Merisio** (or **Merisi**) **da,** Italian painter: b. Caravaggio, in the Milanese, 1569; d. near Porto Ercole 1609. He was at first a journeyman mason, but soon applied himself to the study of painting, studied in Milan and Venice, and afterward went to Rome where he was for a time associated with Cesare d'Arpino and Prospero Orsi, and distinguished himself as the founder of the naturalistic school. His characteristic traits are vigor and truth of *chiaroscuro,* combined with excellent coloring. He was fond of introducing broad and deep masses of shade, whereby a great effect is given to the light. To aid him in producing this effect the room in which he worked was illuminated by a skylight, and the walls were painted black. He excelled in the painting of naked figures. His faults are obvious. Narrow and servile imitation of nature was his highest aim. Annibale Caracci and Domenichino were, perhaps, less distinguished than Caravaggio during their lives, but after their death were ranked higher because, without neglecting coloring and the study of nature, they aimed at correctness of design and dignity of conception. His violent character involved him in many difficulties. He died in consequence of wounds received in a quarrel. The painters who have been influenced by him most are Manfredi, Valentin, Guido Reni, Guercino, Domenichino and Ribeira, called *Espagnolet.* His first paintings are genre pieces, of which the best are 'Card Players' in the Sciarra Palace, Rome, and the 'Gipsy Fortune Teller' in the Palazzo dei Conservatori, on the Capitoline Hill. The works of his later life are large religious pieces, which aroused great opposition in Rome because he used to portray the saints as common types of humanity. 'Saint Matthew Writing the Gospel,' and the 'Death of Mary' are among those which were removed from the churches in Rome; the former being now in the Berlin Museum and the latter in the Louvre. The most renowned of his religious works and his generally accepted masterpiece is the 'Burial of Christ' now in the Vatican, but originally painted for the church of Santa Maria in Trastevere. The facial expressions of all of the figures are remarkable for the depth of the emotion portrayed. It shows great care in execution and harmonious grouping. Accuracy and realism are used in the representation of the figure of Christ. Numerous pieces ascribed to him are to be found in the various galleries of Europe, notably at Berlin and London; but it is doubtful if all are originals. Among his portraits may be mentioned one of himself in the Uffizzi at Florence, and that of the Grand Master of the Knights of Malta (Louvre). His influence as a master of realism in painting was widely diffused over Italy; and the Dutch Naturalists profited much by the careful study of his works. Consult Baglione, 'Le vite de' pittori' (Rome 1649); Fornome, 'Michelangelo Caravaggio' (Bergamo 1907).

CARAVAGGIO, Italy, town and commune in Lombardy in the province of Bergamo, 24 miles east of Milan, on the Gera d'Adda. A steam tramway connects it with Monza and Milan. It is celebrated as the birthplace of the two great painters, Polidoro Caldara and Michelangelo Merisi, both called *da Caravaggio*. It was formerly surrounded by walls and defended by a strong castle. The site of its ancient fortified walls is now occupied by promenades, but the moat remains and is spanned by six bridges. Its principal church has some good paintings, and a lofty campanile. The commune is famous for its melons. Pop. about 10,000.

CARAVAGGIO DA POLIDORO, Italian painter: b. Caravaggio 1495; d. 1543. His real name was CALDARA, but he was surnamed CARAVAGGIO from his birthplace. He went to Rome in his youth and carried bricks at first for the masons who worked in the Vatican. He first felt a great desire to become a painter from seeing Giovanni da Udine and the other painters who were occupied in the Vatican. He formed a close friendship with Maturino of Florence, who assisted him with his advice. Caldara soon surpassed him, and exerted himself to introduce improvements in drawing, having always in view the antiques. Raphael employed him in the galleries of the Vatican, where he painted, under his direction, several excellent friezes. At Messina he executed an oil-painting, representing Christ bearing the cross (1534; in the Museum of Naples), which contains a number of beautiful figures, and proves his ability to treat the most elevated subjects. He has approached more than any one to the style and the manner of the ancients, particularly in imitating their bas-reliefs. His figures are correct, well distributed and arranged; the positions are natural, the heads full of expression and character. It is evident that he would have acquired great celebrity if he had undertaken greater works. He applied himself to the *chiaroscuro*, particularly to that kind of it which is called *sgraffiato*. He showed, also, much talent in his landscapes. At the sack of Rome in 1527 he fled to Naples, and on his return from that place to Rome, in 1543, he was murdered by his domestic. Consult Bertolotti, 'Artisti lombardi a Roma' (Milan 1881).

CARAVAN, a Persian word, used to denote large companies which travel together in Asia and Africa for the sake of security from robbers, having in view, principally, trade or pilgrimages. Such companies often have more than 1,000 camels to carry their baggage and their goods. These walk in single file, and the line is often four or five miles long. To avoid the excessive heat, they travel mostly early in the morning. As every Mohammedan is supposed to visit the tomb of Mohammed once at least during his life, caravans of pilgrims go to Mecca every year from various places of meeting. Of the various caravans which proceed to Mecca every year, the most important has always been the Syrian. The place at which it meets is Damascus, and here the pilgrims and merchants assemble many weeks before the day of departure, which is always fixed according to the season of the year in which the feast of Bairam occurs, the pilgrims requiring to be at Mecca on the day of the feast. As these caravans serve mercantile as well as religious purposes, Mecca, on the arrival of the caravans, resembles a great fair, and this fair is indeed the most important in all the East. The journey from Damascus to Mecca and back occupies about four months. The leader of such a caravan to Mecca, who carries with him some cannon for protection, is called *Emir-el-Hadj* (Prince of the Pilgrims). Trading caravans choose one of their own number for a leader, whom they call Karwan Bashi. Besides a leader, each caravan has its servants, guides, military escorts and priests. Obedience is enforced by the leader in the matter of internal discipline, but in trafficking, each member is independent. Much information on the subject of caravans is to be found in the travels of Niebuhr, who made many journeys with them, and describes them, as is well known, minutely and faithfully.

CARAVANSARI, in the East, a sort of inn, situated in countries where there are no cities or villages for a considerable extent, to furnish travelers with a shelter. The building is generally spacious, enclosing a courtyard containing a fountain or well. Small unfurnished rooms constitute the interior, poorly ventilated and lighted. The interior court is entered at a large gateway, through which loaded camels may pass. Some of them are built with much splendor, though they are generally unfurnished, and the traveler is obliged to bring with him not only his bed and carpet, but also all his provisions and necessaries. In many, the hospitality is gratuitous. It is common for a pious Mohammedan to establish, during his life or by will, one or several of such caravansaries. This kind of benevolence is considered peculiarly agreeable to the Deity, and promotive of the eternal happiness of the founder. Sometimes persons are kept in these establishments to guide the caravans for some distance. See KHAN.

CARAVEL, formerly the name of different kinds of vessels; one used in Portugal of 100 to 150 tons burden; another, a small lateen-rigged fishing vessel used on the coasts of Normandy and Picardy of 10 to 15 tons; and a third, a large Turkish ship of war.

CARAWALA, kā-rạ-wā'lạ, a large viper (*Hypnale nepa*) of Ceylon and southern India, numerous, and greatly dreaded by the natives, especially those who work in the pineapple plantations. It is of small size, rarely exceeding 20 inches in length, and has the extremity of the upturned muzzle covered with scales. Its poison has the peculiarity of not affecting the system until several days after the bite, so that proper remedies immediately applied will counteract the venom.

CARAWAY, an umbelliferous biennial plant (*Carum carui*), with a tapering fleshy root, a furrowed stem, and white or pinkish flowers. It produces a well-known seed used in confectionery, and from which a carminative oil is extracted and a spirit cordial distilled. The plants found wild in America are the descendants of naturalized European plants, that have escaped from cultivation. It is largely grown in England, on strong and rich clays, and is sometimes sown with beans, but more usually with coriander and teazel, or coriander alone. After the coriander, which is only a preparatory crop, has been removed the plants of the caraway are singled out and repeatedly hoed and cleaned. It is cut about the beginning of July, and produces on an average about 900 pounds per acre. It is a favorite crop with the Dutch. The volatile oils in caraway render it of much service in medicine. The action of these oils is to stimulate peristalsis and thus overcome flatulency. They are further antiseptic and check excessive intestinal putrefaction. They act also as mild local anæsthetics and are useful in nausea and vomiting.

CARAYON, kä-rä-yŏṅ, **Auguste**, French historian: b. Saumur, 31 March 1813; d. Poitiers, 15 May 1874. A distinguished Jesuit, he wrote 'First Canadian Missions of the Jesuits' (1864); 'Banishment of the Jesuits from Louisiana' (1865), and similar studies.

CARBAJAL, kär-bä-häl', **Francisco**, Spanish soldier: b. Alavaro 1464; d. near Cuzco, 10 April 1548. He served in the army in Europe; went to Mexico in 1528; and when Pizarro appealed for help against the Inca uprising he was one of the force sent by Cortez to Peru. He was marshal under Vaca de Castro, in the battle of Chupas. He later took office under Gonzalo Pizarro, in the war against Diego Centeno and De la Gasca. At first he was triumphant over Centeno in the Collao, but at the battle of Sacsahuana, 8 April 1528, he was taken prisoner with Pizarro and executed. Because of his remarkable activity in this campaign, despite his years, he was known as the "Demon of the Andes." He was extremely cruel in his treatment of his enemies, but was not less noted for his humor which never failed him, not even at his own execution. Consult Markham, 'A History of Peru' (Chicago 1892).

CARBALLO, kär-bäl' yō, Spain, a town in the province of Coruña and near the coast of the northwestern extremity of the peninsula. It has warm mineral springs and baths. Pop. 13,513.

CARBAZOTIC ACID. See PICRIC ACID.

CARBERRY HILL, Scotland, a rising ground in Mid-Lothian, about seven miles southeast of Edinburgh, between Musselburgh and Ormiston, where Mary, Queen of Scots, surrendered herself to the confederate nobles of the kingdom, 15 June 1567, just before her confinement in Loch Leven Castle.

CARBIDE, in chemistry, a binary compound of carbon with a metallic element, or with certain of the non-metallic elements. Of the known carbides those of iron and calcium are most important. Carbide of iron occurs in steel, and is undoubtedly concerned in some manner, with the hardening of that metal, although the authorities are not agreed as to the precise rôle that it plays. The best-known carbide of iron is the one having the formula CFe_3; but Campbell has shown (*American Chemical Journal*, XVIII, 836) that a series of iron carbides probably exists, having the general formula C_nFe_{3n}, and corresponding in a certain sense to the hydrocarbon series C_nH_{2n}; so that when any one of the carbides of iron is treated with an acid, the corresponding hydrocarbon is set free. Calcium carbide is formed by the action of carbon upon lime at the temperature of the electric furnace. It has the formula CaC_2, and its commercial value depends mainly upon the fact that it is readily decomposed by water, with the copious liberation of acetylene gas (q.v.). Carbide of magnesium is not formed at the temperature of the electric furnace, probably because it is not stable at that temperature. It may be prepared, however, by the action of calcium carbide upon magnesium fluoride, in accordance with the equation $CaC_2 + MgF_2 = CaF_2 + MgC_2$. Like calcium carbide it is decomposed by water with evolution of acetylene gas, the yield being 50 per cent greater, per pound of the carbide, in the case of magnesium carbide. It is not unlikely that magnesium carbide will one day replace calcium carbide for the production of acetylene gas, on account of the larger yield; but this substitution cannot be made on a commercial scale until some cheaper mode of manufacture is found. The chemistry of the carbides is still in its infancy, but within the past few years, and largely owing to the splendid work of Moissan, many new bodies belonging to this class have been discovered. Gold, bismuth, lead and tin do not form carbides at the temperature of the electric furnace, nor do they dissolve carbon at that temperature. Platinum and iridium dissolve carbon freely, but deposit it again, upon cooling, in the form of graphite. Aluminum absorbs carbon freely, with the formation of Al_4C_3, and similar results are obtained with many other metals and metallic oxides. The carbides of chromium, molybdenum, titanium, tungsten and zirconium do not decompose water. Those of calcium, strontium, barium and lithium decompose it with liberation of pure acetylene; but the carbides of aluminum and beryllium yield pure methane, and carbide of manganese gives a mixture of equal parts of methane and hydrogen. Other carbides decompose water with more complex results. Thus the carbides of the rare metals of the cerium group yield complicated mixtures of hydrogen, acetylene, methane and ethylene, and the carbide of uranium gives all these products (except, perhaps, acetylene), and, in addition, copious quantities of various liquid and solid hydrocarbons. The carbides of sodium and potassium, which are best prepared by passing dry acetylene gas over the corresponding metals at a temperature of about 450° F., decompose water with liberation of acetylene. The carbides of titanium and of silicon are characterized by extreme hardness, and it is said that they will even cut the diamond with facility. Carbide of silicon is an exceedingly stable substance, and is now largely used under the trade name of "carborundum," as an abrasive material in the manufacture of grinding-wheels, whet-stones and polishing-cloth.

Moissan's researches with the electric furnace are reported chiefly in the *Annales de Chimie et de Physique*, and useful reviews of them have been printed at frequent intervals in *Nature*. Moissan claims to have been the discoverer of the crystalline carbide of calcium that is now commercially familiar; but in the United States this honor is usually accorded to Mr. Willson, whose labors were certainly quite independent of those of Moissan. See CALCIUM CARBIDE; CARBORUNDUM; ELECTRO-CHEMICAL INDUSTRIES.

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CARBIDE FURNACES. See ELECTRO-CHEMICAL INDUSTRIES.

CARBOHYDRATE, in chemistry, a compound consisting of carbon, hydrogen and oxygen, and having the general formula $C_{6n}H_{2p}O_{p}$. As will be seen, the number of carbon atoms in a carbohydrate is always divisible by six, and the oxygen and hydrogen are present in the same proportion in which they occur in water. It is not implied, however, that the compound contains water as such, but only that the oxygen and hydrogen atoms are present in the proportion of two atoms of the latter to one of the former. It will also be observed that a carbohydrate and a hydrocarbon are two essentially different things, inasmuch as a carbohydrate contains oxygen, while a hydrocarbon is a compound containing no element but carbon and hydrogen.

The carbohydrates constitute a large and very important class of substances, embracing the starches, sugars, glucoses and gums, as well as cellulose. Their chemical relations are intricate, and are far from being thoroughly understood. Several schemes have been proposed for their classification, but owing to the present imperfection of our knowledge none is entirely satisfactory. The classification proposed by O'Sullivan is convenient, however, and will be adopted here.

Class 1.— SACCHARANS: Amorphous substances, having the general formula $nC_6H_{10}O_5$, soluble in water but insoluble in alcohol, and further characterised by the fact that when they are treated with acids they yield substances of the type $nC_6H_{12}O_6$ directly, and without the formation of intermediate compounds. Dextran, lævulan, the amylans and the galactans are examples. (These bodies are gums).

Class 2.— SACCHARENS: Substances possessing a certain amount of structure, having the general formula $nC_6H_{10}O_5$, insoluble in either water or alcohol, and transformed by the action of acids and certain ferments first into $nC_{12}H_{22}O_{11}$, and finally, by the action of acids, into $nC_6H_{12}O_6$. Cellulose, starch, inulin and tunicin are examples; the first two falling under "amylose" in the less elaborate classification which divides the carbohydrates merely into amylose, saccharose and glucose.

Class 3.— SACCHARINS: Amorphous substances, having the general formula $nC_6H_{10}O_5$, soluble in water, but insoluble in alcohol; converted by acids first into $nC_{12}H_{22}O_{11}$, and finally into $nC_6H_{12}O_6$; and by certain ferments into $nC_{12}H_{22}O_{11}$. Glycogen, dextrin and malto-dextrin are examples.

Class 4.— SACCHAROSES (sugars).

Group (*a*).— SACCHARONS: Sweet, crystallisable bodies, soluble in water and in moderately strong alcohol, having the general formula $nC_{12}H_{22}O_{11}$, and convertible by acids and sometimes by ferments into $nC_6H_{12}O_6$. Sucrose (cane sugar), lactose (milk sugar), maltose and raffinose are examples.

Group (*b*).— GLUCOSES: Substances crystallizing, though not so readily as the members of the preceding group; having the general formula $nC_6H_{12}O_6$; soluble in both water and alcohol; and converted by the prolonged action of acids into substances that are no longer carbohydrates. Some of these, such as dextrose, lævulose and galactose, are fermentable by yeast; while others, such as sorbinose, are not fermentable.

Group (*c*).— Certain substances, such as inosite and scyllit, which probably belong in the aromatic series and bear no special resemblance to the other members of the carbohydrate family.

O'Sullivan has also a fifth class, including those substances which, though they may not be carbohydrates in the strict sense, are nevertheless closely allied to the carbohydrates and are easily converted into them when hydrolysed. In this class he places the glucosides and certain of the gums, mucilages and pectins.

The carbohydrates are exceedingly important elements in the world's food supply, and may indeed be said to be essential to the maintenance of life. They are practically all of vegetable origin, and are derived ultimately from certain simple fundamental substances that are formed in the green leaves of plants. Under the influence of sunlight the chlorophyll contained in the leaves is competent to split up the carbon dioxide of the air, retaining the carbon and setting the oxygen free. The carbon that is abstracted in this way is caused to combine with the water that the leaves contain, with the production of carbohydrates; but the identity of the carbohydrate that is first formed in this way, and which serves as the starting-point for the others, is not yet established. According to the views of Sachs the "first obvious product" is starch, the formation of which he explained by the equation:

$$\begin{array}{ccccccc} \text{Carbon Dioxide} & & \text{Water} & & \text{Starch} & & \text{Free Oxygen} \\ 6CO_2 & + & 5H_2O & = & C_6H_{10}O_5 & + & 12O \end{array}$$

It appears more likely, however, that formic aldehyde, CH_2O, is the first product, as is indicated by the equation

$$H_2O + CO_2 = CH_2O + 2O,$$

and that the subsequent products are built up by polymerization.

Carbohydrate metabolism is one of the most important physiological processes of the animal body. The carbohydrates are the chief source of energy and heat in the body. Most of the carbohydrates are converted into maltose by the digestive processes. This, during the processes of absorption and assimilation, becomes dextrose, which sugar is the only normal sugar of the circulating fluids and the tissues. The dextrose is taken up by the blood, conveyed to the liver by the portal vein and a part stored up in the liver cells. Some of the dextrose is also stored in muscle, and certain portions of it are utilized by the nucleoproteids of the body. The fate of the glycogen of the body is to be oxidized into carbon-dioxide and water. The steps of this process of oxidation are very much involved, but it seems certain that an oxidizing ferment, perhaps from the adrenal glands, acting in conjunction with the pancreas, is largely influential in the process. A failure to bring about sufficient oxidation of the sugar in the body causes the well-known symptom of glycosuria, one of the features of diabetes (q.v.).

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CARBOLIC ACID, a substance having a formula C_6H_5OH, possessing feebly acid properties, and occurring chiefly in that part of the distillate from coal-tar which passes over at temperatures between 310° and 440° F., known as the "middle oils" or "carbolic oils." It is also found in small quantity in the later distillate, between 450° and 520°, known as "creosote oil." Chemically, carbolic acid has the structure of an alcohol (q.v.), and is an aromatic compound derived from benzene by the substitution of the hydroxyl group, OH, for one of the typical hydrogen atoms. It is also known as phenol, phenyl hydrate or phenyl alcohol.

Carbolic acid is obtained for commercial purposes almost exclusively from gas-tar. The carbolic oil is washed with a solution of caustic soda of a specific gravity 1.075 to 1.100. In quantity the solution is somewhat more than sufficient to extract all the carbolic acid, but not enough to take up all the cresylic acid also. The resulting phenate of soda solution is drawn off and is used to wash another portion of the oil, when the cresylate of soda is decomposed, and the cresylic acid is replaced by carbolic acid. In this way a solution consisting almost wholly of carbolate of soda is obtained. This is purified by blowing steam through it, as long as it carries away any oils. The purified phenate of soda is then decomposed by carbonic acid gas and a small quantity of sulphuric acid, and the carbolic acid set free floats on the surface and is skimmed off. The crude carbolic acid thus obtained contains about 15 per cent of water, and a little cresylic acid. It is purified by distillation and crystallization. A part remains liquid, and this is sold as liquid carbolic acid, or it is turned back to be worked up again. The drained crystals are treated with concentrated sulphuric acid and potassium bichromate, and redistilled. For medicinal purposes it is again distilled in glass vessels.

Carbolic acid, in the pure state, crystallizes in white, deliquescent needles, having a strong characteristic smell slightly suggestive of tar. The reddish color noted when it has been exposed to the air is attributed to minute traces of lead. It melts at 106° F., and boils, under ordinary atmospheric pressure, at about 360° F. Its specific gravity is about 1.07. It dissolves in alcohol, ether and many other organic liquids, but is only moderately soluble in water under ordinary atmospheric conditions. It readily absorbs a small quantity of water from the air, forming a hydrate which is fluid at temperatures above 63° F. If the liquid so formed is shaken with water, the greater part of the carbolic acid separates out upon standing, and the vessel is found to contain an upper layer consisting of water in which a small amount of carbolic acid is dissolved, and a lower layer of carbolic acid in which a little water is dissolved. It does not exhibit very marked acid properties, but dissolves in the alkalis with the formation of salts called phenates. It does not have a strong affinity for the alkaline bases, however, and from a strong solution of sodium phenate (for example) it may be again separated in the form of an oily liquid by the addition of another acid; the new acid appropriating the base to itself, and setting the carbolic acid free. A solution of carbolic acid, even when very weak, develops a red color when boiled with a solution of mercurous nitrate and nitrous acid. This reaction, which serves for the detection of carbolic acid, is said to be delicate enough to indicate one part of the acid in more than 100,000 parts of water. In the arts large quantities of carbolic acid are used in the manufacture of salicylic acid (q.v), and it is an important source of picric acid and coralline in the dye-making industry. It is consumed in immense quantities in making high explosives after transformation into picric acid.

In medicine, carbolic acid has many uses. It is highly poisonous to living matter, and is used extensively to kill bacteria. In surgery it it used to disinfect wounds, and as an antiseptic dressing in proportions of from ⅕–2 parts of acid to 100 of water. It, or some of its derivatives or allies, is used to sterilize instruments and bed linen, the walls and floors of rooms (by washing) and dejecta. Internally, carbolic acid is used as a bactericide, limiting excessive intestinal putrefaction. It is also an anæsthetic, and is at times of service in irritability of the stomach. When used in too concentrated a solution it is an active caustic, causing a white, painless burn. Alcohol is an excellent antidote. Taken internally in pure form in doses over two to three drops it causes poisoning with a characteristic series of symptoms. There is burning in the mouth, fauces, œsophagus and stomach. The whitish scars of the lips and mouth are characteristic. There is great pain, with vomiting of large quantities of mucus, clamminess of the skin and restricted respiration. There is usually ringing in the ears, headache and vertigo; the urine may be suppressed, reddish or greenish; and death results with small, rapid pulse, collapse, and, may be, convulsions. Similar symptoms may develop slowly in sub-acute forms of poisoning. The urinary symptoms usually lead to the diagnosis. The treatment of the acute form of poisoning is the free use of gastric lavage, ingestion of alcohol usually in the form of whisky slightly diluted and the use of lime water, and solutions of sulphate of soda or sulphate of magnesia. Symptomatic treatment and careful nursing are necessary for other symptoms.

RICHARD FERRIS.

CARBOLINEUM, derived from the Latin word *carbo*, coal, *oleum*, oil, to form a trade name for a new commodity, is a distillation from coal-tar or bituminous shale, containing phenoloid hydrocarbons of a highly preservative nature. Extensive deposits from which carbolinuem is obtained are found in the grape-growing countries bordering on the Rhine, various other parts of Europe and some places in America. The liquid in its commercial form is of a nut-brown color, but it is a stain rather than a paint. However, it can be washed off a person's hands with cold water without leaving any stain. Tests made with it prove that it has many times greater penetrating power than linseed-oil. It never crystallizes. When it has been painted upon wood and has become apparently thoroughly dry, its action does not cease. If the wood is then painted with a heavy coat of white-lead mixed with linseed-oil, the carbolineum will make its appearance through the paint in a short time. Consequently, any wood that is first treated with carbolineum cannot be painted without previous sizing. Owing to carbolineum being composed of heavy hydrocarbons, it is only slightly inflammable; but when ignited by holding a match in contact with the carbolineum for a short time, it burns with a bright red light, giving off considerable carbon in the form of a dense smoke. Large quantities of carbolineum are made by subjecting crude anthracene (green oils) to heavy pressure, and adding zinc chloride and chlorine. There are also on the market imitations of carbolineum, made from the heavy oils of petroleum. These are deficient in the specific preservative qualities which have given the original carbolineum its reputation. As made from coal-tar, carbolineum is a substance with distinctive physical and chemical qualities. It distils between the temperatures of 570° and 735° F., following the creosote oils. Unlike the latter it has no destructive effect upon wood fibre, nor does it have to be applied under heat (350°) and pressure (125 pounds) as with creosote oils, cooking the wood and deadening its fibre. Once the outer layer of the wood is dry the carbolineum enters, leaving the pores open so that interior moisture escapes as the preservative makes its way in. The creosote oils close the pores and confine the interior moisture.

Carbolineum first came into use about the year 1876. The grape-growers of the Rhine valley were much annoyed with insects and sustained considerable loss by the rotting of the posts and poles used in their vineyards. It is said that Richard Avenarius, who was an officer in the German army, first suggested the use of carbolineum as a wood preservative.

Carbolineum is usually shipped in barrels and then put in small packages to accommodate the retail trade. It is retailed at about 75 cents per gallon. The most extensive users are the tanners, railroad companies, maltsters and farmers. Railroad ties and posts are dipped in it in an open tank before setting.

Some of the railroad companies after due experiment have made extensive use of it, even "painting" parts of the woodwork of their freight cars with it. It is used in a modified form by dyers. Farmers use it for painting hog-pens, chicken-coops and barns for the purpose of destroying lice and other vermin. The carbolineum may be applied directly to the skin of animals, without injury.

Considerable litigation has grown out of the promiscuous use of the word "carbolineum" by manufacturers. Richard Avenarius did not obtain a trade-mark on the word "carbolineum" when he first used it, and never obtained a patent on carbolineum, and many others began its manufacture under that commercial name. Eventually he filed the word "carbolineum" as a trade-mark in Austria. but subsequently his trade-mark was revoked and protection refused on the ground of the general use of the word. Also, he registered the word "carbolineum" as a trade-mark in the Patent Office of the United States, as No. 14,048, dated 8 Feb. 1887. His right to such use was questioned and considerable litigation ensued. The matter had not been settled definitely when, in 1917, American manufacturers were permitted to use German patents and trade-marks under license.

Richard Ferris.

CARBON, a non-metallic element, existing in nature in large quantities, both in the free and combined states. It exhibits marked allotropy, at least three distinctly different forms of it being known. These are (1) amorphous carbon; (2) graphite; and (3) diamond. Amorphous carbon is formed when wood or coal or almost any vegetable matter is heated strongly, out of contact with the air, and is familiar to everybody as charcoal, coke and lampblack. Graphite (q.v.) occurs native, and may also be artificially prepared in various ways. Diamond (q.v.), which is crystallized carbon, also occurs native in certain regions, and pure specimens that are devoid of color, or which have certain special tints, are highly esteemed as gems.

Carbon has the chemical symbol C, and an atomic weight of 12.005 if $O = 16$, and 11.91 if $H = 1$. The specific gravity of diamond is 3.51, that of graphite is from 2.11 to 2.26 and that of hard gas-coke is about 2.35. The linear coefficient of expansion of diamond (Fahrenheit scale) is 0.00000066 at ordinary temperatures, and that of graphite is 0.0000044. Graphite has an electrical conductivity of about one-twelfth of that of mercury, and hard gas-coke, about one one-hundredth. Diamond is practically a non-conductor. The specific heats of diamond and graphite are quite different at ordinary temperatures. Thus at 50° F. diamond has a specific heat of 0.113, graphite 0.160 and wood charcoal about 0.165. These values increase as the temperature rises, and at about 1100° F. all three varieties have a common specific heat of about 0.44.

Carbon is infusible, and insoluble in any known liquid at ordinary temperatures. It dissolves to a limited extent in melted cast iron, and in melted platinum it dissolves freely, separating out again in the form of graphite upon cooling. It is unaltered by the action of acids, except when some powerful oxidizing agent like chlorate of potassium or bichromate of potassium is also present. Chemically it is tetravalent in nearly all of its compounds. It combines with oxygen in three different proportions, with the formation of a monoxide CO, a dioxide CO_2 and a suboxide C_3O_2. It also forms, with hydrogen, a great number of compounds known as hydrocarbons (q.v.); and it combines with many of the metals to form carbides (q.v.). With hydrogen, oxygen, nitrogen and small quantities of other elements, it constitutes the entire substance of animals and plants; and the coal beds upon which our modern civilization is founded are composed of vegetable remains from which the elements other than carbon have been mostly expelled by the combined action of heat and pressure. See Aromatic Compounds; Carbon Compounds; Charcoal; Coal; Electro-Chemical Industries; Diamond; Fatty Compounds; Graphite.

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CARBON BISULPHIDE. See Electro-chemical Industries.

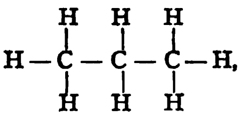
CARBON BLACK, the trade term given to black made from gas. It was originally called hydrocarbon gas black, and a black of a similar nature to that now made was manufactured both in this country and in Europe from artificial gas. The industry did not, however, assume any importance before 1872, when the first patent was obtained for producing this black from natural gas. Since that date, many patents have been taken out in connection with the manufacture of this black from natural gas, and at the present time there are 10 distinct processes in use.

The abundance of natural gas in the United States, and the automatic method used in making the black, have enabled manufacturers in this country to produce it at so much lower prices that little of this black is now made from artificial gas, and large quantities of the product are exported annually. The total production of carbon black in this country in 1914 was valued at $900,630, of which about one-seventh was exported. See Blacks.

CARBON COMPOUNDS, in chemistry, those compounds which contain the element carbon. These are of two classes, the organic and the inorganic, the former being by far the larger and more important; so much so that the chemistry of the carbon compounds is practically synonymous with «organic chemistry.» Until within the past half-century it was thought by many authorities that the compounds that occur in animals and plants are essentially different in nature from those that are produced in the laboratory, and that they cannot be obtained without the action of the «vital principle.» This idea received its first blow in 1828, when Wöhler prepared urea from substances that had been previously considered to be inorganic; yet as late as 1849 the great chemist, Berzelius, defined organic chemistry as «the chemistry of compounds formed under the influence of life.» A vast number of substances that were formerly classed as organic have now been prepared in the laboratory, and the old classification of chemistry into organic and inorganic branches has broken down, the organic division being now more correctly called the «chemistry of carbon compounds.»

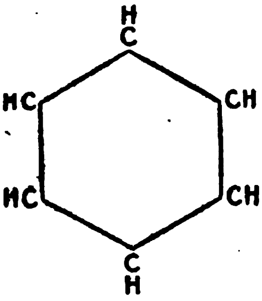
The organic carbon compounds form a group of great complexity, and are apparently unlimited in number. The reasons for this are that carbon is quadrivalent; that it forms multitudes of compounds with hydrogen alone, in many of which more or less of the hydrogen can be replaced by other elements, with the formation of new and altogether different substances; that its chemical bonds are apparently powerful; and that it unites with elements of the most widely different nature.

In a general way, the better-known carbon compounds are mostly divided into two great classes, according to the type of the «graphical» or «structural» formula that must be used in order adequately to represent their chemical relations. The first class includes all those bodies whose structural formulæ are distinguished by the fact that the atoms (or radicals) that are present form «open» chains, which do not anywhere return into one another. The hydrocarbon «propane,» which has the structural formula



$$\begin{array}{cccccccc} & & \mathrm{H} & & \mathrm{H} & & \mathrm{H} & \\ & & | & & | & & | & \\ \mathrm{H} & - & \mathrm{C} & - & \mathrm{C} & - & \mathrm{C} & -\mathrm{H}, \\ & & | & & | & & | & \\ & & \mathrm{H} & & \mathrm{H} & & \mathrm{H} & \end{array}$$

is an illustration of this class. The «open chain» compounds are called fatty compounds, and are treated under that heading. The name was originally given because many of the substances that are included in the class have long been known in connection with fats and allied bodies; but it would be more logical to call them «methane derivatives,» since they may be considered to be obtainable from the hydrocarbon methane, CH_4, by a process of substitution.



The second great class of carbon compounds is distinguished by the fact that the structural formulæ that are required in order to exhibit the chemical properties of its members return into themselves, so as to form «closed» chains or rings, which (at least in the fundamental forms) contain six carbon atoms. Benzene is a familiar example. From the fact that many of the first known representatives were balsams, oils and resins, these substances are known collectively as aromatic compounds, and are described under that heading. A better name would be «benzene derivatives,» since all the members of the class are derivable from benzene by substitution. See Aromatic Compounds.

In addition to the aromatic and fatty compounds, others are known which do not properly come under either heading. Thus the structural formula of furfuran contains a closed ring, formed by the union of four atoms of carbon and one of oxygen. Closed rings, consisting of three, four and five atoms of carbon, are also known. The pronounced analogies and affinities that exist among the members of the aromatic and fatty groups, respectively, have forced those two groups upon the attention of chemists. Those compounds of carbon which are not strictly included within either have not yet been classified upon a similarly broad basis.

The principal phenomena of the carbon compounds are given under special headings. In addition to those already given, see, particularly, Isomerism; and Radical. For an excellent presentation of the whole subject, consult Hjelt, ‹Principles of General Organic Chemistry.›

Among the inorganic carbon compounds the more important are dealt with under separate headings: see Carbonic Oxide, Carbon Dioxide and Carbon Disulphide. With few exceptions the others are interesting chiefly as chemical substances, with no distinctive use in the arts. The most useful of all is

Carbon tetrachloride (CCl_4), at first produced by exposure of chlorine and chloroform in mixture to the action of sunlight, it is now generally prepared by the chlorination of carbon disulphide in the catalytic presence of powdered aluminum chloride. It is a colorless liquid, with a pungent aromatic odor, boiling at 170° F. It is soluble in alcohol and ether, and is itself a solvent of fatty organic substances. Through this property it is of considerable importance in manufactures, replacing carbon disulphide, as its vapor is not inflammable. In its effects on the human system it closely resembles chloroform.

Carbon trichloride (C_2Cl_6) is produced by exposing ethylene chloride (or other derivatives of ethyl and ethylene) to the action of chlorine in sunshine; or by heating propyl chloride with iodine trichloride. It is colorless and nearly tasteless, and has an aromatic odor resembling camphor. It is insoluble in water, but dissolves in all oils and in ether and alcohol, from which it crystallizes in right rhombic prisms. It vaporizes at ordinary temperatures.

Carbon dichloride (C_2Cl_4) is prepared by adding carbon trichloride in small portions to an alcoholic solution of hydrated potassium sulphide as long as sulphureted hydrogen is evolved. The liquid is then distilled, and the distillate diluted with water, upon which the carbon dichloride separates. It is a stable liquid at zero F. and boils at 240°. It dissolves in alcohol, ether and the oils, but not in water, acids or alkalis. It absorbs bromine, in direct sunshine, forming *carbon chlorobromide.*

Carbon oxychloride ($COCl_2$), a colorless liquid obtained when a mixture of carbon monoxide and chlorine is exposed to sunshine; and also by heating a mixture of chloroform, potassium dichromate and sulphuric acid. Its boiling point is 47° F.

Carbon suboxide (C_3O_2), or carbon carbonyl, discovered by Diels and Wolf in 1906, is formed by treating a solution of dibrommalonyl chloride in ether with zinc shavings. The pure suboxide is a colorless liquid with a pungent odor resembling mustard oil, and is quite poisonous. It boils at 44° and is solid at —224°. At low temperatures carbon suboxide is quite stable, but between 30° and 60° if even a trace of impurity be present, it polymerizes into a dark red solid. It is inflammable, burning with a bright blue flame and the emission of much smoke.

Carbon nitride (C_2N_2), see CYANOGEN.

Carbon subnitride (C_4N_2), at temperatures below 70° a solid substance crystallizing in fine white needles. Above 70° it is a liquid with an odor resembling cyanogen, boiling at 170°, and breaking into flame if heated to 265°.

Carbon oxysulphide (COS), a colorless gas soluble in water, with an odor resembling sulphureted hydrogen, and highly suffocative. It has the notable specific gravity of 2.10, and may easily be poured from one vessel into another. It is inflammable, passing when burning into carbon dioxide and sulphur dioxide. At zero F., and under a pressure of 12½ atmospheres it becomes a colorless and highly refractive liquid which dissolves sulphur, and mixes with either ether or alcohol, but not with water.

Several compounds of carbon and bromine are important to the student of chemistry. They are *carbon tetrabromide* (CBr_4); *carbon tribromide,* or *hexabromide* (C_2Br_6); *carbon dibromide* (C_2Br_4); and *carbon bromide* ($C{:}CBr_2$). The last named is spontaneously inflammable in contact with atmospheric air, and highly explosive. From these carbon compounds with bromine springs an extended list of derivatives.

RICHARD FERRIS.

CARBON DIOXIDE, CARBONIC ACID GAS, or CARBONIC ANHYDRIDE, CO_2, is formed whenever carbon is burned in the presence of excess of oxygen or air. It is a colorless, odorless gas about 1.53 times as heavy as air, bulk for bulk, and soluble to a considerable extent in cold water, especially when subjected to pressure. Its solution possesses feebly acid properties, and has a peculiarly pungent taste, on account of which the aqueous solution of the acid is greatly used as a constituent of various beverages. The effervescence accompanying the opening of a bottle of beer, soda-water or champagne is due to the escape of the carbon dioxide that was previously held in solution under pressure. Carbon dioxide occurs in great abundance in nature, both free and in combination with various elements in the form of carbonates. Carbonate of lime, $CaCO_3$, is one of the most common carbonates. It is formed when the gas is allowed to bubble up through a solution of lime water and exists in nature in vast masses as limestone and marble. (Other carbonates are described under the metals that constitute their bases). Carbon dioxide is a constant constituent of the atmosphere (see AIR), occurring even at the tops of mountains and in the air collected by balloons at great height. It is generated by the combustion of fuel, by respiration, by fermentation and by the decay of animal and vegetable matter. In some localities, too, immense quantities of the gas are emitted from the ground, or from mineral springs and wells, as at Saratoga Springs in the United States, and in the Grotto del Cane, the Cave of Montjoly in Auvergne, in the valley of Wehr, in the Eifel and at many other places in Europe. It is being simultaneously abstracted from the air by plants, which in the sunlight decompose the gas, fixing the carbon that it contains, and setting the oxygen free. Carbon dioxide has but feeble affinity for the bases with which it combines, and is readily displaced by almost any other acid. In preparing the gas for experimental purposes the usual method is to add a dilute mineral acid to pulverized marble or other carbonate, the carbon dioxide then being liberated continuously and in large quantities. On a large scale carbon dioxide is made by heating limestone to redness in closed retorts, at the bottom of which superheated steam is blown in. This passes up through the heated limestone carrying with it the liberated carbon dioxide, and through outlets at the top into coolers and compressors. Besides its large use in the manufacture of aërated drinks, carbon dioxide is used in sugar factories to clarify the cane juice after treatment with lime. It is also used to preserve wines from deterioration by certain molds, and other organisms which set up acetic fermentation. Wine thus treated is distinctly improved in quality. Carbon dioxide is the active principle in baking powders, being liberated from the soda carbonate by the acid constituent of the powder, and in its efforts to escape from the dough produces the lightening effect.

The critical temperature of carbon dioxide is about 88° F., and at any temperature lower than this it can be reduced to a liquid by the application of pressure. Liquid carbon dioxide is colorless. It will not mix with water, but dissolves readily in alcohol, ether and volatile oils. When the pressure is released, part of the liquid vaporizes rapidly, and the remainder solidifies through the production of intense cold. Solid carbon dioxide is a white mass resembling snow. It remains for some time open to the air without melting. Its interior temperature, however, as shown by a thermometer sunk into the mass, is — 110° F. Its melting point is — 70°.

Poisoning by this gas frequently results in closed rooms crowded with people. The symptoms may be very slight, consisting of a mild indisposition, or they may be severe — headache, nausea, vomiting, etc. In poisoning in the severer grades there is cyanosis, coma and unconsciousness. Carbon dioxide is not in itself a fatal poison; it becomes so, however, in the absence of a sufficient supply of oxygen, death being produced by simple asphyxiation.

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CARBON DISULPHIDE, or **SULPHOCARBONIC ACID,** CS_2, a liquid formed when the vapor of sulphur is passed over red-hot charcoal and the resulting gases cooled in a condenser. Under normal conditions it is a very volatile, inflammable liquid, with a specific gravity of 1.29, and boiling at 115° F. It burns with a blue flame, giving off sulphurous and carbonic acid gases. Burned in a Bunsen burner, with proper precautions against explosion, it produces a flame of actinic power exceeding that of burning magnesium. A special light for photographic purposes is produced by burning a mixture of vapor of carbon disulphide and nitric oxide, which yields a bluish flame rich in actinic rays. Mixed with three parts of oxygen, or an equivalent (in oxygen) of atmospheric air, the vapor forms a dangerously explosive mixture. Practically the whole commercial supply of carbon disulphide is made from coke and sulphur in the electric furnace. (See ELECTRO-CHEMICAL INDUSTRIES). The commercial disulphide has an exceedingly disagreeable smell, but this is due to the presence of impurities. The pure liquid, produced by simple distillation, has a pleasant, ethereal smell. Carbon disulphide (or bisulphide) dissolves sparingly in water, in the proportion of 1 part in 1,000, forming a valuable disinfectant. It mixes freely, however, with alcohol, ether, benzene and the fixed oils in almost every proportion. It dissolves sulphur, phosphorus, caoutchouc and many other organic bodies that are almost insoluble in other menstrua, and it is to this property that it owes its commercial value. It is used in largest quantity in the rubber goods manufacture, not only in the preparation of a cement, but also in the making of rubberized cloth by coating or infiltrating with a thin solution of rubber. It is also used to dissolve the natural grease out of wool, and fatty oils out of seeds and oilpress residues, or oilcake; and in the recovery of oils from all kinds of waste material. In its purest refined state the disulphide is employed to extract the most delicate essential oils from aromatic seeds and spices, and perfumes from flowers. In quite another direction it is efficient in preserving furs and woolens from moths, as an insecticide upon infested plants and in the burrows of such animal pests as moles, gophers, woodchucks, etc., to destroy them. As a chemist's aid in quantitative analysis it is indispensable. It has a wide chemical interest as the most energetic of sulphurizing agents, aiding in the production of many sulphides not obtainable otherwise. Because of its high degree of volatility it is used in the production of low temperatures by its own evaporation. Under the air-pump a cold of —76° F. has been attained by its use.

Poisoning by carbon disulphide is becoming very prevalent since the use of rubber goods has become so extensive. The symptoms of acute poisoning are due to a poisoning of the blood and a central paralysing action on the nervous system. The blood action is that of a breaking up of the red blood cells, hæmolysis. This results in cyanosis, pains, headache, vertigo, nausea, vomiting, weakness, unconsciousness, coma and death. Such acute cases are rare, the poisoning developing as a rule much less rapidly. In workers in rubber factories, in which there is much vapor of CS_2, there develop disturbances of temper, loss of memory, pressure feelings on the head, heat, and the feeling as if the blood would burst through the skull, with headache. There may also be symptoms of irritation of the bronchi, coughing and roughness of the voice, etc. Treatment is fresh air and symptomatic.

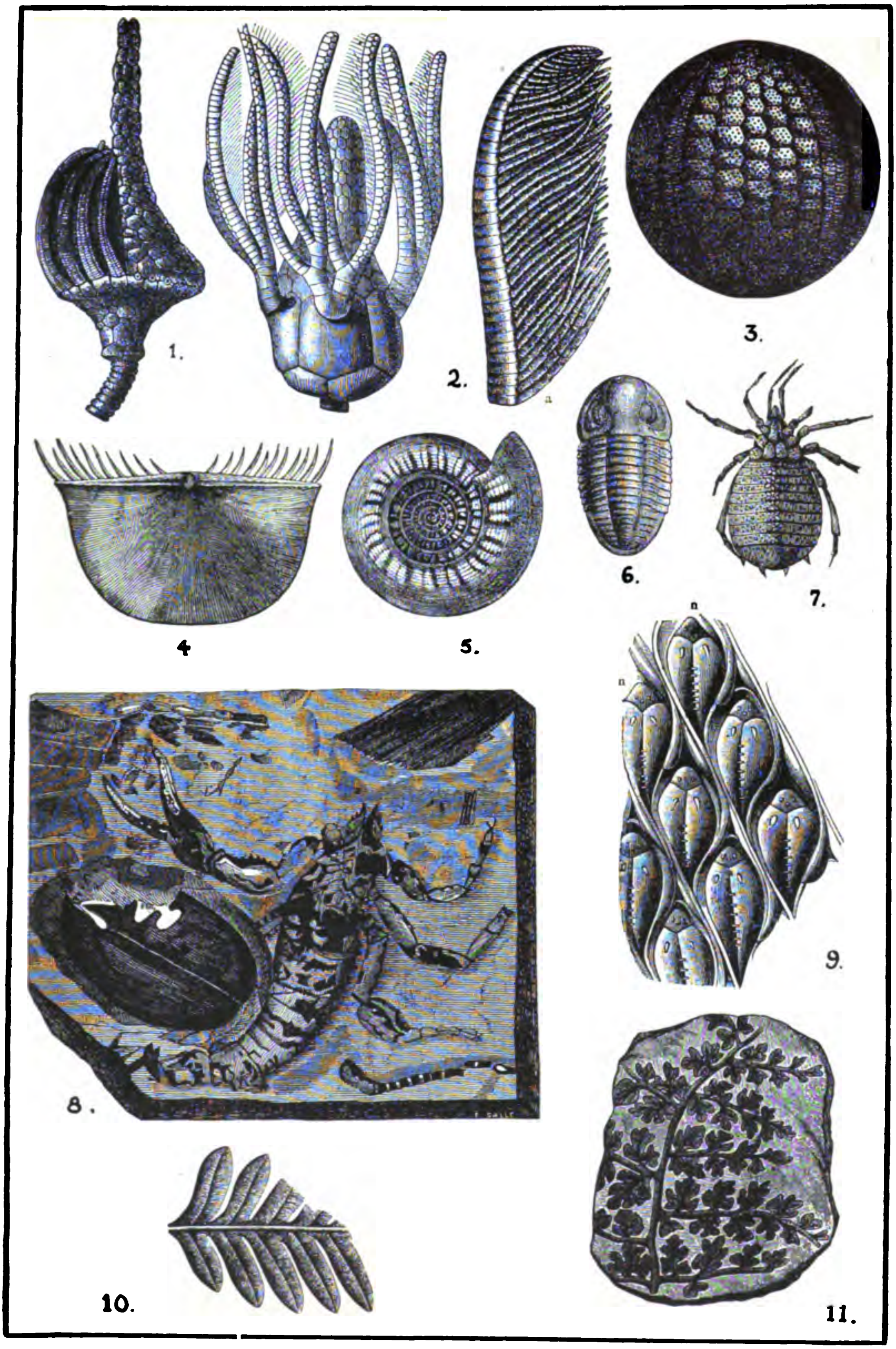
RICHARD FERRIS.

CARBON MONOXIDE, or **CARBONIC OXIDE,** CO, is produced in addition to the dioxide, when carbon is burned with a limited supply of air or oxygen. It is also generated by passing carbon dioxide through a red-hot bed of carbon, in accordance with the equation $CO_2 + C = 2CO$. For experimental purposes the gas may be generated by decomposing oxalic acid by heating it with strong sulphuric acid, and passing the gases that are evolved through a solution of caustic soda or lime to absorb the carbon dioxide that is present. Another method is by passing electric sparks through carbon dioxide. It is evolved in large quantities in the manufacture of carbides, and is collected as a valuable by-product useful in the making of special steels. Carbon monoxide is a colorless gas with a density about 0.97 times that of air. It burns with a lambent blue flame that is often seen in coal fires that have been freshly supplied with fuel. Carbon monoxide is highly poisonous, producing first giddiness and then asphyxiation, as small a quantity as one-half of 1 per cent in the air breathed being fatal, and even as small a percentage as one-fifth of 1 per cent resulting in death if breathed for any length of time. It combines with the hæmoglobin of the blood, and destroys the efficiency of that fluid as an oxygen-carrying medium. Carbon monoxide poisoning is often followed by serious degenerative changes in the brain. This gas is often evolved by self-feeding stoves with deficient draft.

CARBON OXYCHLORIDE. See PHOSGENE.

CARBONADO, a massive, black or dark-gray variety of diamond, also called "black diamond." Though possessing the adamantine or resinous lustre of the crystallized variety, it is opaque and, therefore, of no value as a gem. It is the hardest substance known and this fact makes it the most desirable for use in diamond drills; it therefore sells for as high a price per carat as one carat rough gem diamonds (q.v.). Being without cleavage it is less brittle than the crystals, and owing to its somewhat porous structure, its specific gravity is less, 3.15 to 3.29. The commercial supply comes exclusively from the province of Bahia, Brazil, where it occurs in angular fragments which occasionally show a rough cubic outline.

FOSSILS OF THE CARBONIFEROUS, I



1 Actinocrinus pyriformis
2 Platycrinus trigintadactylus, a single arm with tendrils
3 Plæechinus elegans
4 Chonetes Dalmanni
5 Goniates Jossæ
6 Phillipsia
7 Eophrynus Prestwichi
8 Cyclophthalamus Bucklandi; beside it is the wing-sheath of a beetle
9 Lepidodendron dichotomum, showing the stigmata of the leaves
10 Aletopteris Serli
11 Sphenopteris obtusiloba

CARBONARI, kär-bō-nä'rē (colliers, or more strictly, charcoal-burners), the name of a large political secret society in Italy. According to Botta's ‘Storia d'Italia’ the Republicans fled, under the reign of Joachim (Murat), to the recesses of the Abruzzi, inspired with an equal hatred of the French and of Ferdinand. They formed a secret confederacy, and called themselves carbonari. Their chief, Capobianco, possessed great talents as an orator. Their war-cry was «Revenge for the lamb mangled by the wolf!» When Murat ascended the throne of Naples he employed Maghella, a Genoese, in the Department of Police, and afterward as minister. All his efforts were directed to the union and independence of Italy, and for this purpose he made use of the Society of the Carbonari. The ritual of the Carbonari was taken from the trade of the charcoal burner. Clearing the wood of wolves (opposition to tyranny) was the symbolic expression of their aim. By this they are said to have meant at first only deliverance from foreign dominion; but in later times democratic and anti-monarchical principles sprang up. They called one another good cousins. No general union of the order under a common head seems to have been effected. The separate societies in the small towns entered into a connection with each other, but this union extended no farther than the province. The place of assembly was called the hut (*barraca*); the surrounding neighborhood was called the wood; the meeting itself was distinguished as the sale (*vendita*). The confederation of all the huts of the province was called the republic, generally bearing the ancient name of the province. The chief huts (alta barraca) at Naples and at Salerno endeavored to effect a general union of the order, at least for the kingdom; but the attempt appears to have been unsuccessful. The order, soon after its foundation, contained from 24,000 to 30,000 members, and increased so rapidly that it spread through all Italy. In 1820, in the month of March alone, about 650,000 new members are said to have been admitted; whole cities joined the Society. The military, in particular, seem to have thronged for admission. The religious character of the order appears from its statutes: «Every Carbonaro has the natural and inalienable right to worship the Almighty according to the dictates of his conscience.» After the suppression of the Neapolitan and Piedmontese revolution in 1821, the Carbonari throughout Italy were declared guilty of high treason, and punished by the laws. Meantime societies of a similar kind had been formed in France, with which the Italian Carbonari amalgamated, and Paris became the headquarters of Carbonarism. The organization took on more of a French character, and gradually alienated the sympathies of the Italian members, a number of whom dissolved connection with it, in order to form the party of Young Italy, under Mazzini. Consult ‘Memoirs of the Secret Societies of the South of Italy, particularly the Carbonari’ (London 1821); Cantù, ‘Il Conciliatore e i Carbonari’ (Milan 1878); Johnston, R. M., ‘Napoleonic Empire in Southern Italy, and the Rise of the Secret Societies’ (London 1904); Bandini, ‘Giornali e scritti politici clandestini della Carbonaria Romagnola, 1819–21’ (Rome 1908).

CARBONATES, salts of carbonic acid (H_2CO_3). The carbonates constitute a very important group of minerals. Among economically valuable minerals of this group are the iron carbonate, siderite ($FeCO_3$), the zinc carbonate, smithsonite ($ZnCO_3$), the basic copper carbonates, azurite ($2CuCO_3.Cu(OH)_2$) and malachite ($CuCO_3.Cu(OH)_2$), and the lead carbonate, cerussite ($PbCO_3$). Among the important rock formers are calcium carbonate, calcite ($CaCO_3$), and the double carbonate of lime and magnesia, dolomite $(Ca,Mg)CO_3$. Many other carbonates are known. See MINERALOGY; CARBON DIOXIDE; CALCITE, etc.

CARBONDALE, Ill., city, Jackson County, on the Illinois Central Railroad, 95 miles southeast of Saint Louis, Mo. In a farming and coal-mining region, it ships fruit, flour, live stock and coal, and has numerous industrial plants manufacturing railroad ties, bottles, bricks, flour, etc. Pop. 5,411.

CARBONDALE, Pa., city of Lackawanna County, situated on the Lackawanna River, 110 miles north-northwest of Philadelphia, and on the Erie, the Delaware & Hudson and the New York, Ontario and Western railroads. It is the centre of an important anthracite coal-field, and the principal industry is mining. A variety of other industries are represented, including foundries and machine shops, car shops, metal working plants, glass works and textile mills. The United States census of manufactures for 1914 recorded 43 industrial establishments of factory grade, employing 2,090 persons, of whom 1,897 were wage earners, receiving annually $945,000 in wages. The capital invested aggregated $2,896,000, and the year's output was valued at $3,170,000; of this, $1,639,000 was the value added by manufacture. As it is in a mountain region with fine scenery, it is also a summer resort. The city has a public library, emergency hospital, hospital for the criminal insane, fine Federal building, and a park in the heart of the city, containing a soldiers' monument. Settled in 1824, it was incorporated in 1851, and has adopted the commission form of government. Pop. (1914) 18,500.

CARBONEAR, kär'bŏn-ēr, Newfoundland, a port of entry on the eastern side of the peninsula separating Trinity Bay from Conception Bay, 25 miles in a northwesterly direction from Saint John's. Pop. 3,540.

CARBONIC ACID GAS. See CARBON DIOXIDE; GASES, COMPRESSED.

CARBONIC ANHYDRIDE. See CARBON DIOXIDE.

CARBONIC OXIDE. See CARBON MONOXIDE.

CARBONIFEROUS, the name applied to the last period of the Paleozoic era, and to the system of rocks formed during that period. The Carboniferous has been variously subdivided, the following being the current usage of the United States Geological Survey:

Permian.

Pennsylvanian (coal measures, Upper Carboniferous).

Mississippian (sub-Carboniferous or Lower Carboniferous).

Many geologists divide the Carboniferous into Lower and Upper, but give the Permian the rank of a period. Mississippian and Pennsylvanian are terms derived geographically in the United States, and are not used abroad. A few American geologists consider that they too are of the rank of periods, and would discard the old term Carboniferous altogether. Permian is derived from the province of Perm, in Russia, and Carboniferous from carbon (coal) in the rocks of the system.

Palæogeography of the Carboniferous in North America.— The Mississippian opened with shallow epicontinental seas widespread over central United States, as at the close of the Devonian (q.v.). In the east the Pocono and Mauch Chunk formations are largely terrestrial, being a great series of delta and coastal plain deposits built up at the west edge of a land mass, Old Appalachia, which was persistent through several of the preceding periods, on the site of the present Piedmont, Coastal Plain, and farther east into the present Atlantic Ocean. In the seas of the great interior the sediments of the epoch are largely limestone. At the close of the Mississippian there was widespread emergence east of the Rocky Mountains, with folding in the Ouachitas and also in Europe. This emergence was accompanied by widespread erosion, and the Pennsylvanian rocks rest unconformably on the Mississippian and older beds. Throughout Pennsylvanian times most of eastern United States was low and swampy with luxuriant vegetation, which accumulated and was buried to form coal. Occasional submergences occurred and marine beds are intercalated with coal seams. The marine beds are more abundant in central than in eastern United States; and in the Rocky Mountains and Great Basin the sea persisted practically through the epoch, and the rocks are almost wholly marine. During the Permian the region east of the Mississippi River was land, and humid during the early part of the epoch, as shown by coal beds. West of the Mississippi River, the land gradually emerged during late Pennsylvanian and early Permian and the climate grew arid. Great salt lakes were extensive and beds of salt and gypsum are abundant. At the same time there were similar deserts in Germany, in which the great German salt deposits were formed. Strangely enough, other continents, even within the torrid zone, were undergoing glaciation at the same time, particularly Africa, Australia and India. These extreme conditions, together with the great period of folding that formed the Appalachian Mountains, wrought a profound change in types of plants and animals, and brought to a close not only the Carboniferous Period, but the Paleozoic Era as well.

As the rocks laid down in Carboniferous time furnish by far the greater part of the world's supply of coal, they have been very carefully studied in many different places and accurately mapped, so that more is known of the Carboniferous rocks than those of any other Paleozoic system.

The Lower Carboniferous or Mississippian series, in Nova Scotia and New Brunswick, is made up of thick beds of sandstone and limestone overlaid by limestones containing masses of gypsum. The total thickness of the series is 6,000 feet. In Pennsylvania the Lower Carboniferous series has a total maximum thickness of 4,000 feet of sandstone and shale. Farther west the Lower Carboniferous is represented largely by limestones with a maximum thickness of over 1,200 feet in southern Illinois. In southwestern Virginia are limestones, sandstones and shales of Lower Carboniferous Age, 2,000 feet thick, and containing a few workable beds of coal. In the Rocky Mountains the Lower Carboniferous rocks are, with few exceptions, limestones.

The rocks of the Upper Carboniferous or Pennsylvanian include the great coal fields of eastern North America. (For the origin of coal fields, see Coal). They are sandstones or conglomerates, grits, shales, clays, limestones and seams of coal. The total thickness of the Nova Scotia coal measures is 7,000 feet, and 76 distinct seams of coal are known. In Pennsylvania the coal measures have a total thickness of 4,000 feet. In Michigan the coal measures are about 300 feet thick; in the eastern interior (Illinois-Indiana) field 600 to 1,000 feet, and in the western interior field the thickness varies widely, reaching a maximum in Arkansas.

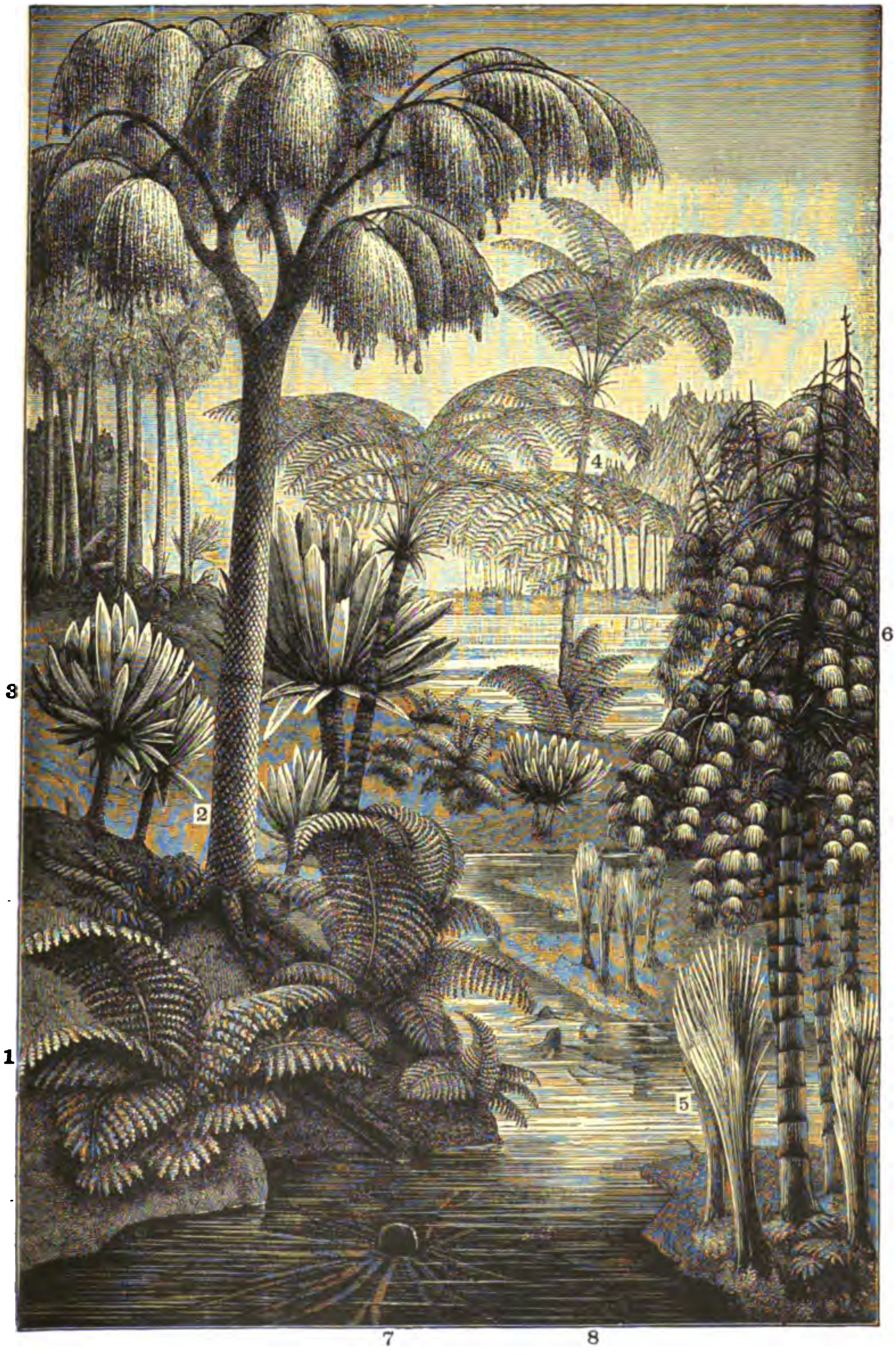
The Upper Carboniferous rocks cover wide areas in Utah, Colorado and Arizona; they also occur in the Black Hills in South Dakota, and in California, and British Columbia. They are generally limestones or sandstones and contain no coal beds. The distinction between Upper and Lower Carboniferous is not as sharp as in the Mississippi Valley. The total thickness of the whole Carboniferous series in Nevada and Utah is about 13,000 feet.

Carboniferous in other Continents.— In western Europe the Lower Carboniferous limestones reach from Ireland to Central Germany, with a maximum thickness in England of 6,000 feet, and are overlaid by coal measures. In Asia the Chinese coal measures are of Upper Carboniferous Age, and are underlaid by Lower Carboniferous limestone. In South America the Lower Carboniferous is mostly made up of sandstones, and the upper of limestones, with very few coal seams.

Life of the Carboniferous.— The plant-life of the Carboniferous Period showed some advances from the Devonian. The ferns were most abundant, some being like tall trees, others as small as the maidenhair fern of to-day. The most conspicuous growths in the Carboniferous forests were the Lycopods or club-mosses, now represented by insignificant forms, but then growing sometimes 75 feet or more high, with trunks three feet in diameter, and spreading branches (*Lepidodendron*). Other Lycopods (*Sigillaria*) had short, thick trunks with few if any branches. Still another group, the horse-tail rushes, were of far greater importance in Carboniferous times than now. Of these the *calamites*, with their tall, slender stems, must have been one of the commonest plant forms of the Carboniferous forest. No plant with conspicuous flowers existed.

Of animal life, corals were abundant; and the *Foraminifera*, especially the genus *Fusulina*, became of importance. The extinct blastoids were abundant, and the Carboniferous is the period in which the crinoids, or sea-lilies, reached their highest development. Sea-urchins were more plentiful than in the Devonian, but the trilobites were slowly dying out. Scorpions were fairly abundant, and the first true spiders appeared. The brachiopods were less abundant than in the Devonian. Bivalve

FOSSILS OF THE CARBONIFEROUS



1 The Tooth-Fern — Odontopteris
2 The Scale Tree — Lepidodendron
3 Cordaites Borassifolia
4 Pecopteris Cyathea
5 Calamites
6 Sigillaria
7 Rhizome of Sigillaria in Water
8 Foliation of Aunularia

mollusks were numerous, among them being the first land shell. Of the fishes, the sharks were remarkably developed. Amphibians, which probably existed in Devonian, increased greatly in Carboniferous time, but belonged to an order now extinct, and were of moderate size, no species being over eight feet long. Consult Chamberlin and Salisbury, 'Geology' (Vol. II, New York 1907); Cleland, H. F., 'Geology, Physical and Historical' (New York 1916); Dana, 'Manual of Geology' (New York 1895); Geikie, 'Text Book of Geology' (London 1903) 'Report of the United States Geological Survey' (1900–01, part III). See COAL; CLAY; GEOLOGY.

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CARBONIFEROUS LIMESTONE, or **MOUNTAIN LIMESTONE,** certain limestones of Lower Carboniferous Age, as named by Murchison and other English geologists. In the United States the silver-lead ores of Leadville and other Rocky Mountain camps, and the zinc and lead ores of southwestern Missouri, are in limestones of Carboniferous Age. See CARBONIFEROUS.

CARBORUNDUM, a trade name for silicon carbide (SiC). This compound is produced by heating sand and carbon together in the electric furnace. It is characterized by extreme hardness, and its principal use is for abrasive purposes, as a substitute for corundum and emery. It was discovered in 1891 by E. G. Acheson, and is now manufactured in large quantities in the great electric laboratories at Niagara Falls. The operation is carried on in a furnace in which the bed and ends are permanent, and the side walls temporary, being made up of loose firebrick for each charge treated. The furnace is 16 feet long and 5 feet wide. The electrodes enter the interior through the ends. They consist of clusters of carbon rods, interspersed with copper connections. The material used consists of 54.2 parts of sand, mixed with 9.9 parts of sawdust and 1.7 parts of common salt — the last acting as a flux. The amount of each charge is about 30,000 pounds, and this weight includes 34.2 parts of coke broken into pieces about the size of pea coal. A part of the charge is spread on the bed of the furnace so as not to touch the electrodes but up to their level. In the centre of this is built a core of coke connecting the electrodes. The remainder of the charge is then heaped upon the core, the walls being built up to a height of five feet, and the heap between them reaching eight feet. The current used is at the beginning of the process 165 volts and 1,700 amperes. Later this is reduced to 125 volts but increased to 6,000 amperes. The run continues for 36 hours, during which 1,000 horsepower is expended. The furnace is then allowed to cool for two days, when the walls are torn down and the contents removed. The coke core has been graphitized by the heat, and outside of this is a layer a foot thick of graphitic carbon. Next to this layer is the crystallized carborundum, amounting to about 6,700 pounds, and in addition there is about 5,000 pounds of amorphous silicon carbide. The carborundum is broken up in a crusher and the crushed material digested with sulphuric acid for three days at a temperature of 212° F. It is then washed, and after being kiln-dried it is graded by screens to the several degrees of fineness in which it is sold. Carborundum in powdered form is placed on the market in considerable quantities as carbide of silicon for the introduction of silicon into iron, the material being very readily dissolved by the fused metal. Since carborundum is infusible and is only oxidizable at extremely high temperatures in a large amount of free oxygen, it follows that the temperatures ordinarily generated for smelting ores and metals are much below its point of destruction. Finely powdered carborundum is made up into a highly refractory paste with fire clay, lime and sodium silicate, which is applied by means of a brush or otherwise to bricks which are intended to be used for building a furnace, or the bricks are actually immersed in the viscous liquid for a certain time. If the furnace has already been built, the paste can be painted on the surfaces exposed to the fire. It is stated that a coating one-twelfth of an inch thick will protect the bricks from the attack of the highest temperature that is ever produced by combustion methods in ordinary work.

RICHARD FERRIS.

CARBUNCLE, a general term used to describe any red garnet when cut *en cabochon.* Pliny and other early writers apparently applied the name "carbunculus" indiscriminately to ruby, ruby spinel and garnet. The best usage at the present time confines it to the almandite garnet when cut *en cabochon,* that is, with a rounded convex surface. Usually such stones are hollowed out at the back and a piece of metal foil is inserted in order to lighten the otherwise too dense red color.

CARBUNCLE, in pathology a deep infection of the subcutaneous tissues by means chiefly of the *Staphylococcus* organisms, which are always present in the air. These infections take place through minute cuts or the hair follicles and are located chiefly in the nape of the neck. In addition to the local discomfort graver constitutional symptoms such as fever, headache, loss of appetite and loss of flesh are present. The local discomfort is apt to develop into deep, painful burning and throbbing. Pus is formed and gradually makes its way to the surface through minute orifices, or the whole area breaks down into a sloughing ulcer with a hard, deep, angry centre called the "core." The whole process may take one or two months before complete recovery occurs. The treatment is dietetic, hygienic and surgical.

CARBURETOR. An essential adjunct to internal combustion engines of the explosion type, performing the twofold operation of vaporizing the fuel (gasoline, benzol or alcohol) and mixing this vapor with the proper proportion of air to form an explosive compound. The instrument consists of a tubular air-intake into which is projected the fuel tube. The liquid fuel is atomized into a fine spray by the rush of air past the open mouth of the tube through which the fuel is fed in a constant flow regulated by a float valve in a float chamber. The importance of the delicate adjustment of the carburetor appears in the fact that upon the accurate admixture of the air and fuel depends the smooth working of the engine. The proportion of air to gasoline required under ordinary running conditions is 8,400 parts to one. In starting a cold engine, however, a larger percentage of gasoline is needed, and to supply this an auxiliary carburetor is sometimes arranged to cut in temporarily, until the engine gets warm. Many varieties of the carburetor are in existence, but all are the same in principle. Special forms of carburetor have been devised for kerosene and other liquid fuels, with but partial success. See Automobile; Automobile Engine; Internal Combustion Engine. Consult Bramley, F. H., 'Modern Carburetters' (London 1913); Brewer, R. W. A., 'Carburetion' (London 1913); Browne, A. B., 'Handbook of Carburetion' (New York 1916).

CARCAGENTE, kär-kä-hän'tą, Spain, town of Valencia province, on the river Jucar, at the junction of the Valencia-Murcia and Carcagente-Denia railways. The centre of a region of orange, palm and mulberry trees, it also cultivates rice extensively, for which climate and soil are particularly well adapted, and it has modern linen and silk mills. Carcagente is of great antiquity with interesting Roman ruins. Pop. 12,300.

CARCANET, kär'kạ-nĕt, a jeweled necklace or chain, an ornament referred to by Shakespeare, and by Tennyson in 'The Last Tournament.' Venice was famous for its manufacture of carcanets in the 15th century.

CARCANO, kär-kä'nō, **Giulio**, Italian poet: b. Milan 1812; d. 1884. He was appointed professor at the Academy of Fine Arts in Milan in 1859, and became a senator in 1876. He wrote a narrative poem, 'Ida della Torre,' while a student at Pavia (1834). His next work, 'Angiola Maria' (1839), had extraordinary success; it is a deeply sympathetic story of Italian family life, and is regarded as the highest type of that class in Italian. In the same vein is the volume 'Simple Narratives' (1843). He wrote also 'Damiano, the Story of a Poor Family' and other works. Consult Prina, 'Giulio Carcano' (1884); and Rizzi's preface in 'Lettere di Giulio Carcano' (Milan 1887).

CARCAR, kär'kär, Philippines, a city on the northern coast of the island of Cebu, situated on the Bay of Carcar, 23 miles from the city of Cebu. It is near the head of the bay and on the road running along the eastern coast of the island. Pop. 31,895.

CARCARILLA, the bark of a tree (*Croton eleuteria*), of the family *Euphorbiaceæ*. This is a shrub of the Bahamas and now yields most of the cascarilla of commerce, although in former years other species were used. It contains tannic acid, volatile oils, cascarillin, a glycoside and some resin. In medicine it is used as an aromatic bitter in combination with other remedies for constipation, indigestion and loss of appetite.

CARCASS, in military language, an iron spherical case filled with combustible materials, which is discharged from a mortar, howitzer or gun. It does not burst, but has three fuseholes through which the flame rushes, firing everything within its influence. Carcasses are of considerable use in bombardments for setting fire to buildings, vessels lying in harbors, etc. They will continue to burn for 8 or 10 minutes, and are not even extinguishable by water.

CARCASSONNE, kär-kạ-sŏn', France, capital of the department of Aude, on both sides of the river Aude and on a branch of the Canal du Midi, 53 miles south of Toulouse. It consists of an old and a new town which communicate by a bridge of 12 arches spanning the river. The old town is surrounded by a double wall, part of it so ancient as to be attributed to the Visigoths, and is defended by a castle. Its streets are narrow, dirty and desolate, forming a striking contrast to those of the new town, which is regularly built, and has many handsome modern houses. The principal buildings are the restored cathedral of Saint-Nazaire, the courthouse, the prefecture, the old market and the churches of Saint Michel and Saint Vincent. The town contains a lyceum, a teachers' college, a seminary, a public library and a museum. The boulevards are finely planted. The chief manufacture is that of woolen cloth which is exported chiefly to the Levant, the Barbary states and South America. Carcassonne also manufactures paper, leather, linen, soap, ironware and pottery, and there is also a considerable trade in wine, grain, brandy, fruit and leather. The whole department is represented at its November fair. The ancient city, Carcaso, in the province of Gallia Narbonensis, fell into the hands of the Visigoths about 725; it was ruled by viscounts from the 11th to the 13th century and was united to France in 1209. In 1247 King Louis the Saint founded the lower town. It was pillaged and burned by the Black Prince in 1355, and in 1566 a Huguenot massacre took place within its walls. Consult Fedie, L. 'History of Carcassonne' (Carcassonne 1888).

CARCHEMISH, kär'kĕm-ĭsh, an ancient city on the Euphrates, formerly thought to be the same as the Roman Circesium, but now more generally located near Jerabis, a village on the west bank of the Euphrates. The earliest known references to Carchemish are found in the Cuneiform texts in the British Museum (II Bu. 88-5-12, 163; 11 and 88-5-12, 19, 8.) It was the northern capital of the Hittites. Thotmes III met the people of Carchemish in battle about 1501–1447 B.C. and in 1140–05 B.C.; it was once captured by Tiglath-Pileser I. It was made to pay tribute by Asurnazirpal III, and Shalmaneser III, whose artists represented the famous fortress on the walls of Balawat, but was not finally subdued by the Assyrians until taken in 717 B.C. by Sargon II, who deported the inhabitants and settled Assyrians in the city. In 608 B.C. it was captured by the Egyptian Pharaoh, Necho. At this time Josiah, king of Judah, was killed (mentioned in 2 Chron. xxxv); but the city was retaken by Nebuchadnezzar in 605. Consult Rawlinson, G., 'The Five Great Monarchies' (2d ed., Vol. II, p. 67); Finzi, 'Ricerche per lo studio dell' antichità Assira' (pp. 257ff. 1872); Maspero, 'De Carchemis Ceppidi Situ et Historia Antiquissima' (1873); Schrader, 'Keilinschriften und Geschichtsforschung' (pp. 221ff. 1878); Delitzsch, 'Wo lag das Paradies?' (pp. 265ff. 1881), containing extracts from the notebooks of George Smith; Hoffmann, G., 'Auszüge aus syrischen Acten persischer Märtyrer' (p. 163, 1880); Sachau, 'Reise in Syrien und Mesopotamien' (pp. 168f. 1883); Müller, W. Max, 'Asien und Europa' (p. 263, 1893); Johns, in *Proceedings of the Society of Biblical Archæology* (p. 141, 1899); Sarsowszky, in *Zeitschrift für Assyriologie* (pp. 377 seq. 1911); Benzinger, in Baedeker's 'Palestine and Syria' (1912).

CARCINOMA. A tumor of the epithelial-tissue type. See TUMOR.

CARD INDEXING, Commercial, the adaptation of the principle of the modern library card catalogue to the multifarious uses of industrial, mercantile and commercial life. Following the practical American development and improvement of the various Old-World principles and rules laid down for the cataloguing of libraries, and the establishment after 1876 of library bureaus for furnishing standard supplies, it was speedily recognized that card systems for facilitating the record of the affairs of business life and their multitudinous details, were henceforth to be — as in the case of the telephone, the typewriting machine and accessories — indispensable adjuncts to the equipment of every well-appointed office, store, factory or institution throughout the world.

The invention of time and labor-saving systems and devices of all kinds speedily followed, and now, any branch of any kind of business, from the simplest to the most complex, can advantageously install and use a card system, and procure standard supplies of blank or special printed ruled forms with full information as to their application for the keeping of accurate records of all affairs in the most practical way.

The development of commercial card systems also led naturally to a corresponding and commensurate growth of office furniture, fixtures and accessories for their accommodation, which include: box tray and drawer cases for card indexes; various kinds of folders, guides, indexes, storage and binding cases for vertical files; indexed transfer cases for flat files, elastic or expanding filing and other cabinets for document, check and mercantile reports, etc.; specially devised stands, tables, desks, etc.

For classifying work by separating miscellaneous information — grouping information of the same kind together — no other method has been found to equal the card-index system, the impossibility of keeping different facts about the same business or profession recorded in a bound book with any degree of sequence or order being now universally recognized. The card indexing system has proved of especial advantage, and is now extensively utilized in the offices of government, state and municipal departments, of railroad, telegraph, telephone, electric light, gas and waterworks companies, real estate and trust corporations, building and loan associations, fire, life and accident insurance companies, solicitors' and underwriters' agencies, benevolent societies, lodges, banks and other financial institutions, factories, wholesale commercial and mail order houses, publishers, advertising agencies, professional men, clergymen, lawyers, physicians, oculists, dentists, specialists, etc.

By means of the card index system, names, facts, figures of any description, recorded on cards of uniform size, are arranged alphabetically, numerically, territorially, chronologically, or according to any suitably defined order in boxes, trays or drawers of cabinets of special design. Various plans, ranging from simple to complex, are used for special indexing. All, however, are transparently concise in arrangement and of facile adaptation for reference. The most simple form of card-indexing is the alphabetical-subject plan in which the name is indexed alphabetically and the subject indicated by different tab cards. In territorial card-indexes, the names are first classified by states, with alphabetical guides for each city or commercial community in the state, the cards bearing the records of firms or individuals being filed back of the alphabetical guides. Chronological card-indexes are divided into monthly, daily and alphabetical sections, distinguished by different colored cards, and back of each monthly guide is arranged a set of blank daily guides, so that cards may be filed in advance for attention on any day of any month. Each card with its record has an individual existence in its relations to others of the system, and is always to be found in its place, notwithstanding the cumulative and expansive principle of the index, which allows cards to be added or withdrawn as needed. Guide or signal cards of different colors with projecting edges or tabs facilitate the immediate finding of the card for rapid reference; the liberal use of these signal cards, carefully inserted in long lists of the same surnames, also obviates a considerable amount of handling and saves time, labor and the wear and tear of the cards.

One of the most ingenious uses of the card system for commercial purpose is its application to the keeping of ledgers, of which the loose-leaf ledger is an offshoot in the developing process of commercial card-indexing. The card ledger does away with the necessity of purchasing books, ledgers or binders and accounts can be posted, checked up, trial balance taken off and statements mailed in approximately half the time required for a book ledger. Accuracy is also promoted by each card representing one account only, which can be laid on the sales sheet or other original record, thus lessening the liability to error in posting. Each account being on a separate card is easily indexed, and no separate or cross-index is required; more perfect indexing is thus ensured; as the number of accounts increase year by year, sets of index cards, with as many subdivisions of the alphabet as desired to facilitate quicker reference, may be substituted for the original set. Statements can be taken off promptly at the first of the month, and where necessary, several clerks can do the billing at the same time, which is impossible with the book ledger. Open accounts only are kept on the regular file; all closed accounts are removed and indexed in a separate file, the only practical method of providing for closed accounts, which can be easily referred to as open ones. The card being removed from the files when the account is closed, and replaced when opened, also obviates the former necessity of transferring accounts from one ledger to another, at the end of each year. Finally the card index ledger can be profitably used for mailing and circular lists. Modern business houses no longer file their correspondence in the old letter boxes. There are various card systems, but the primal scheme is to have a cabinet in place of the separate pasteboard letter boxes. This cabinet is divided into drawers, each deep and wide enough to hold the largest business letterheads when standing in a vertical position. The drawers themselves are divided into compartments for classifying the letters and separated by manila dividers, between which are folders of heavy paper. Marginal index guides on the dividers afford a mechanism for quickly finding any name or classification desired. Supplementing this are various schemes involving different kinds of cabinets for cross-indexing cards, by which the subject matter of letters or the names of the writers as well as of the firms from which letters are received may be indexed. Consult Byles, B. B., ‘The Card Index System’ and articles in *System* (February 1912) and *Engineering Magazine* (July 1913).

CARDAMINE, kär′dă-mīn, a genus of plants of the family *Brassicaceæ*, containing about 60 species with a very wide distribution. They are herbaceous plants with usually pinnate leaves, white or lilac flowers of the usual cruciferous type, and the siliquose fruit which characterizes a section of the family. One of the best-known European and American species is the cuckoo-flower (*C. pratensis*), growing in wet places from Vermont to New Jersey, westward to Wisconsin, and northward. *C. hirsuta* is a common weed in eastern North America, varying in size, according to soil, from 6 to 18 inches in height. The leaves and flowers of this species form an agreeable salad. Numerous other species also occur in North America.

CARDAMON, the seeds of several species of plants of the family *Zingiberaceæ*, perennial plants growing in Asia and Africa. The fruit is used as a stimulant and aromatic. Triangular capsules, from four to five inches in length, contain the seeds, which are of a brown color, a pleasant, aromatic odor and a warm, pepper-like taste. The cardamons known in the shops are produced by *Amomum augustifolium*, a Madagascar plant, and *A. cardamon*, a native of Sumatra and other Eastern islands. Those recognized in the United States pharmacopœia, called true or officinal cardamons, and known in commerce as Malabar cardamons, are the produce of *Elettaria cardamomum*, a native of India. The seeds of cardamon are widely employed in medicine as the basis of vehicles for carrying disagreeable drugs, and also as carminatives and digestants. The volatile oils of cardamon act like other volatile oils in stimulating peristalsis, thus expelling excess of intestinal gases, and they also increase the gastric and intestinal secretions.

CARDAN, or **CARDANO, Girolamo**, Italian philosopher, physician and mathematician: b. Pavia, 24 Sept. 1501; d. Rome, 21 Sept. 1576. He was educated from his fourth year in the house of his father. At 20 he went to Pavia to complete his studies, and after two years began to explain Euclid. In 1524 he took the degree of doctor of medicine at Padua and spent the following seven years practising medicine at Sacco. He was subsequently professor of mathematics and medicine in Milan (1534). In 1552 he journeyed through Europe. He became professor of medicine at Pavia and at Bologna, where he remained eight years. He was forced to resign from the university after his imprisonment on the charge of teaching heretical doctrines. Pope Gregory admitted him to the College of Physicians at Rome, where he continued until his death. His biographers differ with regard to his religious opinions, but he was lost in cabalistic dreams and paradoxes, and pretended to have a familiar demon from whom he received warnings, etc. All this excited the theologians against him, who even accused him of atheism, though the charge was without foundation. He believed so implicitly in astrology that he drew his own horoscope several times, and ascribed the falsehood of his predictions, not to the uncertainty of the art, but to his own ignorance. His two works, ‘De Subtilitate Rerum’ (1551) and ‘De Varietate Rerum’ (1545) contain the whole of his natural philosophy and metaphysics. Cardan wrote also on medicine, and his fame as a physician was very great. His highest claims to the gratitude of the learned rest on his mathematical discoveries. Cardan, it is said, was told that Tartaglia had discovered the solution of cubic equations, and obtained the secret from him by stratagem and under promise of silence, but published the method in 1545, in his ‘Ars Magna.’ The honor of giving his name to the invention has remained to him who first made it known, and it is still called the formula of Cardan. It is universally believed that Cardan discovered some new cases, which were not comprehended in the rule of Tartaglia; that he discovered the multiplicity of the roots of the higher equations, and finally the existence of negative roots, the use of which he did not, however, understand.

Besides the works already mentioned there remain also ‘Practica Arithmeticæ Universalis’ (1539); ‘De Vita Propria’ and ‘De Libris Propriis’ (1571–75); ‘Encomium Geometriæ’ (1535); ‘De Regula Aliza, Excereton Mathematicorum, Sermo de Plus et Minus’ (1540–50). The standard collection of Cardan’s works is that of Sponius (Lyons 1663). Consult Morley, ‘Jerome Cardan’ (London 1854); Rixner and Siber, ‘Leben und Lehrmeinungen berühmter Physiker am Ende des XVI und am Anfange des XVII Jahrhunderts’ (Sulbach 1820); Firmiani, ‘Girolamo Cardano, la vita e l’opere’ (Naples 1904).

CARDAUNS, kär′downs, **Hermann**, German Catholic writer: b. Cologne, 8 Aug. 1847. He was educated at the universities of Bonn, Munich and Göttingen, lectured on history at Bonn in 1872–76 and from 1876 to 1907 was editor-in-chief of the *Kölnische Volkszeitung*. After 1907 he was engaged in literary work at Bonn. He also served as general secretary of the Görresgesellschaft after 1891; was president of the German Catholic Congress at Mannheim in 1902. He has published ‘Die Reformatione Bernensi’ (1868); ‘Papst Alexander III’ (1874); ‘Der alte Fuhrmann’ (1875); ‘Chroniken der Stadt Köln’ (3 vols., 1875–78); ‘Erzbischof Konrad von Hostaden’ (1880); ‘Der Sturz Maria Stuarts’ (1883); ‘Friedrich von Spee’ (1884); ‘M. Stuart, 1566–68, Memoiren ihres Sekr. Cl. Nau’ (1884); ‘Die Erzählung Walters des Erzpoeten,’ a novel (1887; 1899); ‘Die Abenteuer des Johannes Reusch,’ novel (1888; 1908);

'Die Märchen Clemens Brentanos' (1895); 'Geschichte aus dem alten Köln' (1899); 'Der Stadtschreiber,' novel (1900; 1908); 'Alte Geschichte vom Rhein' (1901); 'Die Briefe der Dichterin Annette von Droste-Hülshoff' (1909); 'Die Entdeckung des Südpols' (1909); 'Fünfzig Jahre Kölnischer Volkszeitung' (1910); 'Der Kampf um den Nordpol' (1910); 'Aus dem Leben eines deutschen Redakteurs' (1912); 'Fünfzig Jahre Kartellverband' (1913); and contributions to newspapers and periodicals. Since 1886 he has edited *Vereins-Gaben der Görresgesellschaft.*

CARDBOARD, a thick paper, or aggregation of paper or paper-stock, made by pasting several sheets of paper together and compressing the product between rollers. The finest cardboard, or Bristol board, such as is used for visiting-cards and in the arts, is so made of white paper only, the enamel being produced by brushing China or Kremitz white, a fine variety of white lead, over the surface, drying and rubbing with a piece of flannel previously dipped in finely powdered talc, and polishing with a close-set brush. It is known as three-, four-, six- or eight-sheet board, according to the number of layers of paper. A cheaper grade of white cardboard is composed of coarse white paper for the inner layers and a finer facing paper on the outside. Another variety of cardboard is that used by boxmakers, and is made from coarse brown paper glued and rolled, and faced with white or colored paper, or unfaced, according to the use to which it is to be put. A coarser grade yet is known as millboard. This is used by bookbinders for the covers of books, by boxmakers and for other work in which strength is of more value than appearance. Fine qualities of millboard are also made to some extent. See Paper.

CARDEN, Sir Lionel Edward Gresley, British Ambassador: b. 15 Sept. 1851. After education at Eton College, he went to Havana in 1877 as vice-consul, and in 1883 accompanied Sir S. St. John's special mission to Mexico. In 1885 he was appointed British consul in the city of Mexico, and until 1889 was British commissioner on the Mexican Mixed Claims Commission. From 1898 to 1902 he was consul-general and from 1902 to 1905 British Minister to Cuba. In 1911 he was appointed Envoy extraordinary and Minister plenipotentiary to the republics of Central America; in 1912 was created K.C.M.G.; and in 1913 went to Mexico as British Minister. His recognition of the Huerta government was regarded in some quarters as indicative of an anti-American policy.

CARDEN, Sackville Hamilton, British admiral: b. 1857; entered the navy in 1870, served in the Egyptian War of 1882, in Suakim in 1884 and with the Benin Expedition in 1897. After holding various commands afloat and ashore he became admiral superintendent of Malta dockyard in 1912. In the European War he commanded the British naval force that made the first attempt to break through the Dardanelles in February 1915, assisted by a French squadron under Rear-Admiral Guépratte. After operating for a whole month the great attack on the Narrows failed, with a loss of three battleships and more than 2,000 men. The failure clearly demonstrated that ships alone could not force the passage. Vice-Admiral Carden was compelled by ill health to relinquish his command in March 1915. See War, European — Dardanelles Campaign.

CÁRDENAS, kär'dā-näs, Cuba, a seaport in the province of Matanzas, situated on Cárdenas Bay, due east of Havana on the north coast of the island. It is connected with Havana by rail, and has a large trade in sugar and molasses. On 11 May 1898 the Spanish shore batteries and gunboats at Cárdenas attacked the United States vessels blockading the port, and in the engagement the United States torpedo-boat *Winslow* was disabled, and Ensign Worth Bagley (q.v.) and four sailors were killed. Pop. 32,028.

CARDI, kär'dē, **Lodovico,** surnamed Cigoli, Italian painter and architect: b. on an estate in the Arno Valley known as Castelvecchio, 12 Sept. 1559; d. Rome, 8 June 1613. The name by which he is commonly known, Cigoli, is that of the village near his birthplace. He studied painting under Allori in Florence and architecture under Buontalenti, who introduced him to Sante di Tito of the same city. His first important work dates from about 1581; it is a representation, in fresco, of Christ that the young artist made for the grand cloister of Santa Maria Novella at Florence. His most celebrated picture, 'The Lame Man Cured,' which unfortunately no longer exists, formerly adorned Saint Peter's at Rome. Sacchi thought that it was entitled to hold the first place among the pictures in Rome, after 'The Transfiguration' of Raphael and the 'Saint Jerome' of Domenichino. His 'Martyrdom of Saint Stephen,' executed for the convent of Monte Domini, his 'Tobias the Angel,' in the Hermitage at Petrograd, the 'Saint Francis,' in the Borghese, Rome, his own portrait, in the Uffizi, Florence, and 'The Flight into Egypt,' in the Louvre, Paris, are all noteworthy. "His influence was extraordinary," according to Thieme-Becker, because he was the founder, in Florence, of the baroque style as exemplified in painting.

CARDIA, the upper or cardiac orifice of the stomach, where the gullet or œsophagus enters it, as distinguished from the intestinal opening or the pylorus.

CARDIAC MEDICINES, medicines which act upon the heart. See Heart.

CARDIALGIA, an intense pain over the general heart region. It is usually due to stomach disturbance, heartburn, and is often accompanied by pains in the œsophagus. Heartburn is nearly always due to the presence of large amounts of gas, causing pressure. These gases usually accompany and cause an indigestion. See Heart.

CARDIFF, Ira D., American botanist: b. Stark County, Ill., 20 June 1873. After study at Knox College, at the University of Chicago and at Columbia University he was appointed 1906–07 assistant professor of botany, and 1907–08 professor at the University of Utah. In 1908 he became professor of botany at Washburn College, Topeka, Kan., and in 1909 director of the Washburn Summer School. He was professor of botany in the University of Kansas summer school 1911–12. His contributions to *Plant World*, the *Botanical Gazette* and the *Torrey Botanical Club's Bulletin* made him well known to fellow botanists.

CARDIFF, Wales (Welsh, Caerdydd, perhaps the fortress on the Taff, but derivation uncertain), a municipal and parliamentary borough, raised to the rank of a city (with the title of lord mayor for its chief magistrate) by royal charter in 1905, a seaport on the Bristol Channel, the capital of Glamorgan and the largest town in Wales. The city is built on both banks of the river Taff, a mile above its junction with the estuary of the Severn (known as the Bristol Channel) and extends to the rivers Rhymney on the east and Ely on the west. It is 135 miles west of London, on the Great Western main line from London to New Milford and Fishguard (for Ireland).

Geology.— Almost every geological formation from the Silurian up to the coal measures is found in the ring of higher ground surrounding the plain of recent alluvial deposits on which the city stands.

Trade and Development.— The rapid increase of the last half century is due to the development of the coal trade consequent upon the construction of the Bute docks. The first dock, completed in 1839, was built by the second Marquess of Bute, and five great docks have since been constructed at a cost of £5,500,000. Their total water area is over 200 acres, and the shipments of coal exceed 20,000,000 tons per annum. There are also docks at the adjoining ports of Penarth and Barry. The coal is worked in collieries to the north (nearest colliery nine miles) and shipped at the docks below the city, which is singularly free from any evidence of the staple trade. The fine, wide streets, abundance of trees, freedom from smoke and other evidences of progressiveness are a surprise to visitors. Besides the dock operations, the most important works are the Cardiff Dowlais steel works, the Tharsis Copper Works, numerous ship repairing yards, extensive flour mills, biscuit works, ice and cold storage (with large import trade) and steam trawlers for the fishing industry. The import trade has been developed of late years and Cardiff is now the chief wholesale centre for supplying the teeming populations of the mining valleys of Glamorgan and Monmouth.

Railways.— The Great Western Railway and its connections provide a good and quick service to distant places, while the local railways constructed primarily for mineral traffic, the Taff Vale, Rhymney and Barry respectively, communicate with the districts adjacent. The Midland and London and North Western companies have good depots.

Government and Public Works.— The government of the city is vested in the lord mayor, aldermen and councillors. The oldest surviving charter, granted sometime before 1147, evidences the existence of rights and privileges extending to a much earlier time. Other charters were given by the feudal lords, and later by the Crown. Cardiff returns one member to the House of Commons.

Public Buildings.— The public buildings are being grouped in a park of 50 acres. The town-hall and law courts (cost, £330,000) are completed, as are also the offices of the University of Wales, new buildings for the University College of South Wales and the Welsh National Museum. The secondary and elementary schools are modern, and efficiently equipped and administered, and special provision is made for blind, deaf and dumb, and defective children. Other public buildings include the post-office, custom-house, offices of the Board of Trade and Mercantile Marine, hospitals, etc. The castle, restored and extended at great cost by the third Marquess of Bute, is maintained as one of the residences of his successors.

Libraries.— The public libraries contain 156,000 volumes and include the largest collection of Welsh books and manuscripts in existence. The school library system of the city is one of the best in existence. The museum and art gallery, about to be merged in the National Museum of Wales, contains modern paintings and sculpture; Swansea, Nantgarw and other porcelain, and examples of pre-Norman sculptured stones and crosses.

Churches.— The only ancient church is Saint John's with a fine decorated tower, built in 1473, by Anne Nevill, who inherited the lordship of Glamorgan. She was the wife of Richard Nevill, Earl of Warwick («the king-maker») and mother of Ann, wife of Richard III. There are numerous modern Episcopalian, Roman Catholic and Nonconformist churches. The ancient cathedral of Llandaff is just outside the city boundary.

History.— The Romans had an important station here, extensive remains of their fortifications having recently been discovered in the castle grounds. According to tradition, Cardiff was an important place under the Welsh princes before the Roman occupation; it was certainly a stronghold of the Welsh after the departure of the Romans, and was ravaged by Danes and Norsemen. After the Norman conquest the district was subdued by Robert Fitzhamon and his followers, who established a powerful Marcher Lordship with Cardiff as the capital. The Castle Keep was erected inside the Roman fortification by the Norman lords. The town and district were in the hands of the feudal lords for centuries, and the scene of several bitter contests between the Welsh and their alien masters. Cardiff was at this time surrounded by a high and massive wall and a moat, while the castle, with its law courts and other appanages of feudalism, was a very strong place, guarded by relays of soldiers supplied in rotation from the forces of the under lords, who had castles in the surrounding districts. The lordship reverted to the King in 1495 and was in 1550 granted, stripped of its feudal privileges, to Sir William Herbert, afterward first Earl of Pembroke, from whom it has descended to the Marquess of Bute.

During the civil war Cardiff was an important centre of operations, and was held by the forces of the King and of Cromwell in turn. It was visited by Charles I in 1645, who there sought to revive the loyalty of his followers, but with poor success. The decay of feudalism stripped the town of its importance and it continued to decline until the dawn of the era of coal and iron. Sir Thomas Button, the navigator, was a native of Cardiff.

Population.— In 1801 the population was 1,870, and 50 years later, 18,351. In 1911 it was 182,259.

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JOHN BALLINGER,
Librarian of the Public Libraries.

CARDIGAN, Adeline Louisa Maria, COUNTESS OF, Comtesse de Lancastre: b. 24 Dec. 1824; d. England, 25 May 1915. She was the daughter of Spencer de Horsey, M.P., a notable man of fashion in his day, and her mother was a daughter of the 1st Earl of Stradbroke. One of her brothers was a general in the army, and another an admiral in the British navy, while a son of the latter is a rear-admiral. Miss de Horsey was highly educated in several languages, ancient and modern, and was reported an expert in fencing, riding, dancing and music. In 1858 she married the Earl of Cardigan (q.v.), who died in 1868. She married, secondly, the Count de Lancastre Saldanha, a Portuguese nobleman, who died in 1898. She was a celebrated beauty in her day, and had known Tennyson, Wellington, Talleyrand, Theodore Hook and Tom Moore. In 1909 she startled British society circles with a volume of 'Recollections,' a collection of anecdotes of prominent people she had met in her early life. Some of the tales were of a scandalous nature and not all of them were true, which raised a storm of protest from the descendants and relatives of the people referred to. She was in her 91st year when she died, and it is not improbable that old-age garrulity and confused memory were responsible.

CARDIGAN, James Thomas Brudenell, EARL OF, English general: b. Hambleton, 16 Oct. 1797; d. 28 May 1868. He was educated at Christ Church, Oxford, and was gazetted 6 May 1824, as cornet in the 8th Royal Irish Hussars, under the courtesy title of Lord Brudenell. His family influence and wealth in England procured for him a rapid promotion, and in a few years he had attained the rank of major. Lord Brudenell was next, 3 Dec. 1830, made lieutenant-colonel of the 15th Hussars. He was a member of the House of Commons from the period of his coming of age in 1818, until 14 Aug. 1837, when on the death of his father, he became Earl of Cardigan. After his regiment returned from India Lord Cardigan got himself into difficulties with the officers, who, one by one, had to sell out until the feeling of the regiment broke into mutiny in what was known as the «black bottle quarrel.» This quarrel arose in 1840, while Lord Cardigan's regiment was stationed at Canterbury. One of his officers, Captain Reynolds, having caused wine to be placed on the table in a «black bottle,» Lord Cardigan accused him of degrading the mess to the level of a pothouse. This led to angry words: Captain Reynolds was placed under arrest, demanded a court-martial, but this privilege was withheld from him, and, as the public thought, unjustly. The excitement created by this affair and by his subsequent misunderstanding with another officer, also of the name of Reynolds, had hardly subsided, when he fought a duel with Capt. Harvey Tuckett because this officer had censured his conduct in the *Morning Chronicle*. Captain Tuckett was wounded, and Lord Cardigan tried before the House of Lords, but, although acquitted, public opinion was against him. His reputation, however, as an accomplished cavalry officer, and the satisfaction which the Duke of Wellington expressed in 1848 with the efficiency of the 11th Hussars' Regiment, which was under Lord Cardigan's charge, led to his promotion. On the outbreak of the Crimean War Lord Cardigan was raised to the rank of major-general and appointed brigadier in command of the light cavalry brigade. This brigade constituted the celebrated «Six Hundred,» whose charge at Balaklava will long be remembered as one of the bravest yet wildest feats, perhaps, ever told in the history of war. On that occasion (25 Oct. 1854), Lord Cardigan is said to have received from Lord Lucan, his brother-in-law, an order to capture certain guns from the Russians. A mile and a half had to be traversed, under fire, before the enemy could be met, and the Russian forces stood in formidable array in every direction. The enterprise seemed hopeless. Cardigan, however, led on the charge, and actually took the guns, his men cutting their way through the infantry support and through the cavalry, and then back again, under the play of the Russian batteries, but with fearfully diminished numbers, the survivors not exceeding 150. As the hero of this daring exploit, Lord Cardigan was received with great enthusiasm on his return to England and appointed inspector-general of the cavalry. The charges, however, subsequently alleged by the Crimean commissioners, tended to reduce the high estimate placed upon his services. He published 'Cavalry Brigade Movements' (1861). See CARDIGAN, COUNTESS OF.

CARDIGAN, Wales, a seaport town and municipal borough, capital of Cardiganshire, on both banks of the Teifi, about three miles from its mouth, and 42 miles northwest of Carmarthen by rail. The most noteworthy buildings are the ancient chancel of Saint Mary's Church, a fine specimen of early Perpendicular architecture; the shire hall, Cardigan county school, etc. Cardigan Castle, originally built in the 11th century and famous in Welsh history, stands at the foot of an eminence near the bridge, two circular bastions only now remaining of it. Brick, tile and pottery works are here, and two iron-foundries are employed chiefly in the manufacture of agricultural implements. The salmon fishery is extensively carried on in the neighborhood, and many of the male population are engaged in the mercantile navy. Pop. 3,578.

CARDIGANSHIRE, Wales, a maritime county, having Cardigan Bay on the west and on the land side chiefly Carmarthen, Brecknock, Radnor and Montgomery; area 443,189 acres. The northern and eastern parts are mountainous, the southern and western districts more level. The soil in the vales is chiefly peat, capable of growing either grain or grass, by the application of lime; the higher grounds consist of a light sandy loam, and the mountains are composed chiefly of clay-slate. The agricultural produce is comparatively small. Cattle, sheep and wool are the staple commodities. The chief crops are barley and oats, very little wheat being grown. The lead mines still yield largely, and zinc is obtained in several places. The coast-line is long, and many of the male population are sailors and fishermen. The principal towns are Cardigan, the county capital, Aberystwith, Lampeter, Tregaron and Aberaeron. There are manufactures of gloves and woolens. The county returns one member to Parliament. Pop. 59,870.

CARDINAL-FISH, a fish of the family *Cheilodipteridæ,* characterized by two dorsal fins, the anterior of which consists of from six to nine spines. The anal fin is short and has only two spines. The scales are large and the color is often bright red, whence the name. They are especially abundant in the East Indian seas; but several species are found in America, one of which is known as «king of the mullets.»

CARDINAL FLOWER, the name commonly given to *Lobelia cardinalis,* because of its large, very showy and intensely red flowers. It is a native of eastern North America, growing on the muddy banks of streams. The stems are two or three feet high, the flowers in racemes. It admits of cultivation and is much prized abroad, particularly in England.

CARDINAL GROSBEAK, or RED-BIRD, a large song-bird (*Cardinalis cardinalis*) of the finch family, very numerous in the southern United States. It migrates northward in spring, but never farther than Massachusetts. It is particularly distinguished for its loud, clear, sweet song, whose quality makes it popular as a cage-bird. It is a brilliantly red bird, with a vermillion head, its bill surrounded with a small band of glossy black, and having the long feathers of the crown erected into a conical crest. The female builds her nest, which is made of twigs, grasses, roots, etc., in bushes, and frequently breeds twice in a season, her bluish, brown-spotted eggs numbering about four. This bird is migratory only to a small degree, moving southward only along the northern limits of its range, and occasionally passing the winter in village gardens even in New England.

CARDINAL NUMBERS. See ALGEBRA.

CARDINAL POINTS, the four intersections of the horizon with the meridian and the prime vertical circle. They coincide with the four cardinal regions of the heavens, and are, of course, 90 degrees distant from each other. The intermediate points are called collateral points. See COMPASS.

CARDINAL VIRTUES, in morals, a name applied to those virtues to which all the rest are subordinate, or which comprehend all the others. The distribution of the virtues, which lies at the foundation of this notion, had its origin in the old Grecian philosophy, and the same number is found here as in the elements of nature. These principal virtues, as enumerated by Plato, are prudence, temperance, fortitude and justice. The first three seem to relate to the duties of man toward himself and to correspond with the triple division of the soul into the intellectual, the irrational (the seat of the sensual desires) and the seat of the affections. Justice either relates to our duties to others (God and men), or is the union of the three first virtues. This division appears to be peculiar to the old Pythagoreans. Aristotle divided them still further. The Stoics, too, made the same division in their system of morals and Cicero introduced it into his 'De Officiis.' Plotinus and many New Platonists divide the virtues into four classes — civil or political, philosophical or purifying, religious, and, lastly, divine or pattern virtues; a division coinciding with the rest of his philosophical views. In Roman Catholic theological systems, the cardinal virtues follow Plato. But there is a prior division into theological and moral virtues, the former being faith, hope and charity. The imagination of artists has represented the cardinal virtues under sensible images. In modern times this division is regarded as useless in treating of ethics.

CARDINAL VON WIDDERN, kär'dē-näl fōn vid'dĕrn, **Georg,** German military historian: b. Wollstein, 12 April 1841. He entered the army in 1859; was engaged in the war of 1866 and the Franco-Prussian War; and was professor of the military school at Neisse. He retired in 1890 and has since lived in Berlin. He wrote 'Der Rhein und die Rheinfeldzüge' (1869); 'Belgien, Nordfrankreich, der Niederrhein und Holland als Kriegsfeld'; 'Die Russischen Kavallerie-divisionen und die Armeeoperationen im Balkanfeldzüge' (1878); 'Das 76 Armeekorps und die 7 Kavallerie-division während ihrer selbständigen Operationen im Moselfeldzug bei Metz' (1886); 'Das Gefecht an Flussübergängen, und der Kampf an Flusslinien' (1890); 'Kritische Tage' (1900); 'Verwendung und Führung der Kavallerie 1870–71' (1903); 'Eroberungszüge der Polen im heutigen Deutschland' (1912).

CARDINALS, College of, an ecclesiastical body consisting of the highest dignitaries in the Roman Catholic Church. The name cardinal is applied to one of the principal advisers of the Supreme Pontiff as it is to the principal virtues or to the four points of the compass; etymologically cardinal is from *cardo,* hinge, pivot, tenon, point around which anything turns. In the 11th century the term cardinal appears to have come into use to designate the «bishops collateral to the Pope,» those whose sees are in the neighborhood of Rome, and to the clergy of the principal churches, parishes or *tituli* of the city; but probably *cardinalis* was at first said of a principal church rather than of its ministers. Nor was the term cardinal at first restricted to designation of churches and their clergy in Rome and its vicinity; for a long time, even down to 1585, date of the bull *Postquam* of Sixtus V, which forbade the application of the term to any but members of the sacred college, it was customary to call the ecclesiastics attached to mother-churches or to all cathedrals even, *cardinales.* The use of the word *cardo* or its equivalent to express the relation of a bishop to his clergy and people is very ancient: Saint Ignatius, bishop of Antioch (d. about 202), speaks of the bishop of a church as the pivot on which it turned. Till the issuance of the bull *Postquam* the title of cardinals was currently bestowed, but not by authority from the centre, upon the clergy of cathedral chapters in countries beyond the Alps, as those of the sees of Bourges, Metz, Cologne, Compostella and other cities in Germany, Spain and France; even in Italy the same usage was common; for it was with the name *Cardinalis* as with the name *Papa:* they both were originally applied to church dignitaries, to pastors and Church officers generally; later their application was restricted.

Ever since the reign of Nicholas II the cardinals have possessed the privilege of electing the Pope. The decree of Pope Nicholas (1059) provides that on the death of the Pope the cardinal-bishops shall assemble in council and then the rest of the sacred college shall join them. In naming the Pope the college must take into account the choice of the clergy and people; only in case no Roman priest is found eligible in every way, shall the choice fall upon one that is not a Roman. In the 12th century the sacred college comprised seven cardinal-bishops of the «suburbicarian» churches, Ostia, Rufina, Porto, Albano, Tusculum, Sabina and Palestrina; the cardinal-priests were 28, and were the rectors of as many churches in the city; there were 18 cardinal-deacons, of whom 14 belonged to the clerical staff of churches in the city and 4 to the papal court or household. The members of the sacred college are yet styled by the titles of churches in the city, but are no longer in any sense ministers of those churches or parishes. And, like other Church offices and Church dignities, the cardinalate became an object of ambition or of cupidity; popes bestowed the honor, princes and popes bestowed the dignity and the emoluments of episcopal and primatial sees, with the cardinalate annexed upon minors and infants; thus, John de Medici was raised to the cardinalate at the age of 14 years, being already vested with a number of highest Church dignities; and as late as 1740 a prince of the house of Bourbon was archbishop of Toledo and cardinal at the age of eight years.

According to the present constitution of the sacred college that body consists of 70 members — though very rarely indeed, if ever, are all the places filled. Of the 70 six are cardinal-bishops, and they are the ordinaries of sees in the neighborhood of Rome; 50 cardinal-priests and 14 cardinal-deacons. In 1916 the cardinal-bishops numbered 4, all Italians; the cardinal-priests 48, and of these 5 were Spaniards, 5 were Frenchmen, 2 German, 1 Belgian, 3 American, 3 British and Irish, 3 Austrians, 2 Hungarians, 1 Bohemian, 1 Portuguese, 1 Canadian, 1 Brazilian; the rest were Italians. There were 8 cardinal-deacons, among them 1 Dutch, 1 German; the rest were Italians.

The scarlet hat is distinctive of the cardinalitial dignity, and above the double cross in the arms of the archbishop who is a cardinal is the figure of the scarlet hat with its tasseled pendants. The gown of the cardinal is scarlet (*purpura,* commonly rendered purple, but our «purple» in the language of the ritual is violet, *violaceus*). Hence «to receive the hat» means to be made a cardinal; and to aspire to the purple is to aim at the cardinalitial dignity. Etiquette requires that a cardinal be addressed as Eminence; in English usually «your Eminence,» and every cardinal is *eminentissimus.* A bishop or archbishop who is a cardinal uses such a formula as the following in official instruments (the example is taken from the approbation of a book by an archbishop of Mechlin or Malines in Belgium):

«Engelbert, by the divine mercy, cardinal-priest of the holy Roman Church, of the title of Saint Bartholomew in the Island, archbishop of Mechlin, primate of Belgium,» etc.

CARDING, the process which wool, cotton, flax, etc., are made to undergo previous to spinning, to lay the fibres all in one direction and to remove all foreign substances. The card formerly consisted of a number of iron teeth arranged in a piece of leather of various lengths and the material was combed by hand. For many years this work has been done by machinery, invented in 1738 by Lewis Paul, a Birmingham mechanic. The cards have fine, long teeth fixed on leather strips called card-clothing, which are arranged on a series of cylinders so placed that the material is carried from one to another, until removed by still another and much smaller cylinder called the doffer, from which it is stripped by a moving comb, and then by a series of rolls is delivered in the form of a ribbon into a can, when it is ready for the drawing-frame, on which it is prepared for spinning. Consult Murphy, ‘The Textile Industry’ (Vol. II, London 1912).

CARDIOID, a heart-shaped curve. It is produced by drawing a great number of chords from a single point of the circumference of a circle, prolonging each beyond the further crossing of the circumference to a distance equal to the diameter of the circle, and joining the free ends by a smooth curve. It is a special case of the limaçon, in which the extension of the chords is of any uniform length. The limaçon was invented by Pascal, early in the 18th century.

CARDITIS, kär-dī'tĭs, an inflammation of the heart. The word is not now used, since more definite terms are accessible to designate particular types of inflammation. Thus myocarditis is an inflammation of the heart muscle, endocarditis, of the lining membrane, the endocardium; pericarditis, of the external membrane, the pericardium.

CARDONA, kär-dō'nä, Spain, town in the province of Barcelona, on the right bank of the Cardoner, 50 miles north-northwest of Barcelona. It is a picturesque town of great antiquity, surrounded by Moorish walls and castle, and a church dating from the 14th century. In its vicinity is a hill of rock salt 265 feet high and three miles in circumference, which affords inexhaustible supplies of salt. Pop. 4,002.

CARDOON, a garden vegetable (*Cynara cardunculus*), of the natural order *Compositæ.* It so closely resembles the artichoke (*Cynara scolymus*) that some botanists consider the two species merely as horticultural varieties. The plant, which is a native of southern Europe and the northern part of Africa, is a thistle-like, tender perennial which is cultivated as an annual. Seed is usually sown in spring in a hotbed; the young plants are transplanted to the rich soil of the garden about four feet apart each way and kept cleanly cultivated until the leaves are nearly full grown, when the plant is tied up, covered with straw and earth, to blanch for two or more weeks. The thick leaf-stalks and the mid-ribs are the parts desired. In America the plant is not very popular except with the foreign population.

CARDS, pieces of cardboard, oblong in shape, bearing certain figures and spots; specifically, playing-cards used in various games of chance and skill. Playing-cards are probably an invention of the East, and some assert that the Arabs or Saracens learned the use of cards from the gypsies and spread them in Europe. The Chinese dictionary 'Ching-tze-tung' (1678) states that they were invented for the amusement of Sèun-ho's concubines in the year 1120 A.D. The course that card-playing took in its diffusion through Europe shows that it must have come from the East, for it was found in the eastern and southern countries before it was in the western. The historical traces of the use of cards are found earliest in Italy, then in Germany, France and Spain. The first cards were painted, and the Italian cards of 1299 are found to have been so. The art of printing cards was discovered by the Germans between 1350 and 1360. The Germans have, moreover, made many changes in cards, both in the figures and the names. The Lanzknechtsspiel, which is regarded as the first German game with cards, is a German invention. Of this game we find an imitation in France, in 1392, under the name of lansquenet, which continued to be played there till the time of Molière and Regnard, and perhaps still longer. The first certain trace of card-playing in France occurs in the year 1361, and Charles VI is said to have amused himself with it during his sickness at the end of the 14th century. The modern figures are said to have been invented in France between 1430 and 1461. It has been said that cards were known in Spain as early as 1332; but what is certain is that card-playing must have become prevalent in the course of the century, seeing it was prohibited by the King of Castile, John I, in 1387. Mr. De la Rue, the most extensive manufacturer of cards in England, obtained in 1832 a patent for various improvements in manufacture. The figures on cards had been generally produced by the outlines first being printed from copper plates, and the colors then filled by stencilling. Mr. De la Rue's process was to print them from colored types or blocks exactly in the same way as calico-printing, but all the colors being in oil.

As early as the 15th century an active trade in cards sprung up in Germany, and was chiefly carried on at Nuremberg, Augsburg and Ulm, the demand from France, England, Italy, Spain and other countries producing great prosperity among the manufacturers. In England the manufacture of cards flourished especially under Elizabeth. But no sooner had cards come to be generally used in Europe, than they were prohibited by several governments, partly from moral considerations, the first games being games of chance; partly from considerations of political economy, as in England, where the importation of foreign cards was considered injurious to the prosperity of home manufacturers. The prohibition, however, only tended to increase the taste for cards. In England, under Richard III and Henry VII, card-playing grew in favor. The latter monarch was very fond of the game, and his daughter Margaret was found playing cards by James IV of Scotland, when he came to woo her. The popularity which cards gradually obtained in England may be inferred from the fact that political pamphlets under the name of "Bloody Games of Cards," and kindred titles, appeared at the commencement of the civil war against Charles I. One of the most striking publications of this kind was one in 1660 on the royal game of ombre. Pepys, in his 'Diary,' under the date of 17 Feb. 1667, states that on Sabbath evenings he found "the Queene, the Duchesse of York, and another or two, at cards, with the rooms full of ladies and great men."

The modern pack of cards, used in most of the familiar games, is 52 in number, containing four suits; clubs and spades (black) and hearts and diamonds (red). Thirteen cards compose a suit, consisting of king, queen, knave or jack, and 10 pip-cards ranging in number of spots from one (ace) to 10. The figures of the four suits are supposed to have been originally intended for symbolical representations of the four great classes of men, and the names attached to these figures in England arose from a misapprehension of the names originally assigned to them. Thus, by the hearts are meant the gens de chœur (cœur), the choir-men or ecclesiastics, and hence these are called copas, or chalices, by the Spaniards, whose word espada, sword, indicating the nobility and warriors of the state, has been corrupted into the English spade. The clubs were originally trèfles (trefoil leaves), and denoted the peasantry; while the citizens and merchants were marked by the diamonds (carreaux, square tiles). The word knave (German, knab, boy), was used, of course, in its older sense of servant, or attendant on the knights. The natural rank of the cards in each suit is, king highest, and so on down to ace lowest; but in many games this rank is varied, as in whist, where the ace is put highest of all, above the king; in écarté, where it is put between the knave and the 10; and in bézique, where it is made the highest, but where the 10 is put between it and the king; in quadrille, the rank of some of the cards is variable in every hand. Sometimes the pack of cards is reduced to 32, by excluding the six, five, four, three and two of each suit; it is then called a "piquet pack." An immense variety of games may be played with cards, some involving chance only, others combining chance and skill, the best furnishing intellectual amusement. There are round games, in which any number of persons may join, as poker, hearts, loo, etc.; games for four persons, as whist, in its different forms, and euchre; for two, as piquet, écarté, bézique, cribbage and pinochle, closely resembling bézique, and at present much played in the United States; and there is one game, solitaire, played in many ways, at which a single person often finds both restful diversion and pleasant occupation for the mind.

Consult Singer, 'Researches into the History of Playing Cards' (London 1816); Chatto, 'Origin and History of Playing Cards' (London 1848); Willshire, 'Descriptive Catalogue of Playing and Other Cards in the British Museum' (London 1876); Taylor, 'The History of Playing Cards' (London 1848); Merlin, R., 'Origine des cartes à jouer' (Paris 1869); Van Rensselaer, 'The Devil's Picture Books' (New York 1890); id., 'Prophetical, Educational and Playing Cards' (Philadelphia 1912); Jessel, 'Bibliography of Works in English on Playing Cards and Gambling' (London 1905); D'Allemagne, 'Les cartes à jouer' (Paris 1906), a very detailed account.

CARDUCCI, kär-doo'chē, **Giosue**, Italian poet: b. Valdicastello, Tuscany, 27 July 1835; d. Bologna, 15 Feb. 1907. During his boyhood, which was spent in Tuscany, his father, a dissipated, hot-headed doctor, was his only teacher. An ardent admirer of Manzoni, Latin literature and the French Revolution, he inspired his son with his own love of literature, thus giving him early those ideas and sentiments that were, later on, to make him one of the great leaders of his country, and the most distinctive Italian innovator in literature of all time. 'I Promessi Sposi' the boy read and re-read until the characters of Manzoni's great work became living, breathing human beings to his vivid boyish imagination. 'Gerusalemme Liberata,' Rollin's 'History of Rome,' Thiers' 'History of France,' the 'Iliad' and the 'Æneid' were also his constant companions. In 1849 Dr. Carducci, owing to his revolutionary sympathies, was forced to take refuge in Florence, together with his family; and there Giosue was sent to school, where he proved an excellent student and incidentally read the works of the foremost French, German, Italian and English writers. His youthful poems attracted the attention of the rector of the Normal School at Pisa, then attached to the university, and he was admitted to this institution, receiving board and tuition free. He worked with furious energy, read omnivorously, wrote for the press and compiled an anthology of poetry. Graduating from the Normal School in 1856 he became teacher in the San Miniato Lycée, which he was forced to leave the following year on account of his liberal tendencies. In 1857 his first volume of poems appeared under the title of 'Rime.' He went to Florence with the intention of making literature his life work, but the suicide of his brother Dante and the death of his father in 1858 threw upon him the support of the family. Then began a long and bitter struggle against poverty. He wrote for magazines, tutored and lived, with the family, in a small, ill-furnished garret. For the *Edizione Diamante* he wrote articles covering almost every imaginable subject, and everything he did with the utmost care, devoting his days and nights to research; so that his work ever exhibited the ear-marks of the scholar. During his 10 years with the *Edizione* he produced literary material sufficient in volume and quality for the life work of most men. In 1859, after 10 years' engagement, Carducci married his cousin, Elvira Minicucci. The war with Austria, which broke out in the same year, inspired his poetic muse, and he began contributing stirring poetic odes to the press. Italy began to be curious about this young man who spoke with so much radical enthusiasm and authority. His poems to 'Vittorio Emanuele' and 'Alla Croche di Savia' received enthusiastic welcome, and the latter was set to music, sung in the theatres, recited in the schools and salons, whistled on the streets and repeated among the hosts of the army of liberty. Carducci was appointed professor of Greek in the Lycée of Pistola, a position he resigned in a few months to accept the professorship of literature in the University of Bologna which he was destined to hold for 44 years. He continued working with the same prodigious energy, writing poetry and prose, editing works for the publishing house, preparing university lectures and making extensive researches. His earnestness, brilliant imagery, strong originality and oratorical powers attracted to his classes students from all over Italy and, later, from all over Europe, and Carducci became a name to conjure by. His graduated students formed Carducci societies for the propagation of his ideas round which the literary battle of the century in Italy had already begun. Never before had such lectures on literature been given in any university in Italy as Carducci furnished in his conferences on the 'Development of the National Literature' and its relation to the social history of the Italian people from the earliest days to his own time. In them he became the prophet of Italy whose glorious past he depicted as it had never before been painted. In her he saw Rome living over again in all the majesty and glory of Roman tradition. His intense patriotism brought all liberal, progressive Italy to his feet, and his ardent admiration of ancient Italy and Rome revived the "glorious paganism" of classical days. He attacked bitterly the literary, political and artistic views then generally accepted in Italy; and the more the battle raged the larger grew his classes and his followers which included most of the younger generation. He fought the suzerainty of Austria over Italy, the temporal power of the Catholic Church and the apathy of Italy herself. In turning away from Romanism he set his face against Christianity, as he knew it in Italy, and asceticism which he declared opposed to all progress, beauty and truth. This hatred showed itself in his 'Ode to Satan' (1865), the "immortal foe of autocracy and the banner-bearer of the great reformers and innovators in all ages." In 'Giambi ed Epodi' he struck a new and passionate note that roused all Italy and finally led to his suspension from his classes in the university (1868–70). 'Nuove Poesie' (1873), a collection of 44 new poems, added very greatly to his reputation at home and abroad and made his position secure. The 'Odi Barbare' (1877) had still greater success, the first edition being sold out in a few weeks. In these he discards rhymes and adopts the various metres of Horace with success, in lyrics of great beauty, force and originality.

Gradually, in his later days, Carducci, the ardent Republican, became a convert to monarchism and he was elected member of the Senate in 1890. His last volume of poems 'Ritmi e Rime' appeared in 1899. He resigned his professorship in 1904 and two years later he received the Nobel prize for literature. His published works, which treat of history, biography, political and other controversy, literary criticism, philosophy, lyrical, erotic, descriptive, pastoral and dramatic poetry are among the most extensive in the history of Italian literature. Consult Zanichelli, 'Opere de Giosue Carducci' (Bologna 1909); Chiarini, G. L., 'Carducci' (1913); Granett, R., 'Italian Literature' (1908); Holland, Maud, 'Poems of Giosue Carducci' (20 poems translated, 1907); Williams, Orlo, 'Giosue Carducci' (1914).

John Hubert Cornyn,
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CARDWELL, Australia, town of Cardwell County, Queensland, on Rockingham Bay, 800 miles direct northwest of Brisbane. Its fine harbor has a depth varying from 24 to 60 feet, accessible in all weathers. Dugong fishing and oil extracting, cedar lumber, canning meats, preserve and sauce manufactures are thriving industries, and minerals including gold and tin are found in the vicinity. Pop. 3,500.

CARE SUNDAY, sometimes taken to be the Sunday immediately preceding Good Friday; but generally used to signify the fifth Sunday in Lent. Same as Passion Sunday.

CARÊME, kā-rām, **Marie Antoine,** French cook: b. Paris, 8 June 1784; d. there, 12 Jan. 1833. He was chef de cuisine to many celebrated persons, including Talleyrand, King George IV and one of the Rothschilds. He cooked for the Congress of Aix-la-Chapelle, Vienna and Laibach. He wrote 'Le pâtissier pittoresque' (2d ed., 1842); 'Le maître d'hotel français' (2d ed., 1842); 'Le pâtissier royal parisien' (1828); 'L'art de la cuisine française au XIX siècle' (1833).

CARET, kärā, a turtle. See HAWKSBILL.

CAREW, ką-roo', **Richard,** English antiquarian and poet: b. East Antony, Cornwall, 17 July 1555; d. there, 6 Nov. 1620. He was a member of the House of Commons, high sheriff of Cornwall in 1586, and the author of a much valued 'Survey of Cornwall' (1602); and an English translation of a portion of Tasso's 'Jerusalem Delivered' (1594), and from an Italian version of Huarte de San Juan, 'The Examination of Men's Wits.'

CAREW, Thomas, English poet: b. 1598; d. 1639. He was educated at Corpus Christi College, Oxford. Cultivating polite literature in the midst of a life of affluence and gaiety, he was the subject of much eulogy by Ben Jonson, Davenant and other writers of the period. He was made gentleman of the privy-chamber to Charles I. The King bestowed on him the royal domain of Sunning Hill, a part of Windsor Forest. In him was exhibited the not unusual transformation of the courtly and libertine fine gentleman into the repentant devotee. Carew is coupled with Waller as one of the improvers of English versification. The first collection of his poems was printed in 1640, and the last in 1824. His elegant masque of 'Cœlum Britannicum' was printed both in the early edition and separately in 1651, and the whole were included in Chalmers' 'British Poets.' Carew was much studied by Pope, and Dr. Percy also assisted to restore him to a portion of the favor with which he has come to be regarded. Specimens both of the sublime and the pathetic may be found in his works; the former in his admirable masque, and the latter in his epitaph on Lady Mary Villiers. Recent editions are by Hazlitt for the Roxburghe Library (London 1870); by Ebsworth (London 1893); and by Vincent for the Muses Library (London 1899). 'Poems,' edited by Arthur Vincent in 1899, is the best edition of Carew.

CAREX, kär'ĕks, a genus of plants, belonging to the family *Cyperaceæ*, or sedges, and containing numerous species, which are found in nearly all parts of the world where vegetation can exist, on the driest upland as well as the wettest marsh. The plants are perennial, often creeping, with mostly sharp-keeled leaves and solid triangular stems. The flowers are without perianth and unisexual, being grouped in spikelets. The male flowers have usually three stamens, the female having a single style with two or three stigmas. The number of known species is above 800, and of these the United States has about 300. Hardly any of them have any agricultural value, but *C. arenaria*, the sand-sedge, is of use in binding the sand on many seashores. In parts of the United States a poor quality of hay is made from some of the sedges. *C. morrowi* is an elegant variety with white-edged leaves cultivated by florists.

CAREY, Henry, English composer and poet: b. London 1696; d. there 1743. He is supposed to have been a natural son of George Saville, Marquis of Halifax. His first instructor in music was a German, named Linnert, but he was afterward more thoroughly trained under Roseingrave and Geminiani. He was inexhaustible in the invention of new, pleasing and often deeply pathetic melodies, to which he not infrequently furnished the words. His 'Sally in Our Alley' is still a well-known song. He has also been said to be the author of 'God Save the King,' but this appears to have been doubtful until substantiated by Chrysander. He supported himself by public and private teaching, but his whole life was a continued struggle with poverty, and it has been said that at last, in a fit of despair, he committed suicide (1743). His collected songs were published in 1740. Among other works are 'Teraminta' (1732) and other operas; 'Chrononhotonthologos,' «the most tragical tragedy ever yet tragedized» (1734), a burlesque; 'The Wonder, or An Honest Yorkshireman' (1735); 'The Dragon of Wantley' (1737); and the 'Musical Century, or a Hundred English Ballads' (1737; 3d ed., 1743).

CAREY, Henry Charles, American political economist: b. Philadelphia, 15 Dec. 1793; d. there, 13 Oct. 1879. He was the eldest son of Mathew Carey, and in 1814 became a partner in his father's bookselling and publishing firm, where he continued until 1835. In that year he published an essay on 'The Rate of Wages,' which he afterward expanded into 'The Principles of Political Economy' (1837–40). His other important works are 'The Credit System in France, Great Britain and the United States' (1838); 'The Past, the Present and the Future' (1848); 'The Principles of Social Science' (1858–59); 'Letters on Political Economy' (1860 and 1865); 'The Unity of Law' (1872). Originally a free-trader, he became an advocate of protection on the ground of temporary expediency; held that the growth of population was self-regulating; and was opposed to the theories of Ricardo and others on the law of diminished returns from the soil and on rent. He was also opposed to any arrangement on the subject of international copyright. Some of his works have been translated into other languages, and his writings have had considerable influence on economic writers such as Frédéric Bastiat and Dühring.

CAREY, James F., American Socialist leader: b. Haverhill, Mass., 19 Aug. 1867. He received a common school education and learned shoemaking. In 1895 he was chairman of a convention at Boston, which amalgamated three national organizations of shoemakers into one union. In 1894 he was one of the leaders in the agitation of the unemployed on Boston Common, and the governor appointed him a commissioner of the unemployed, but he was not confirmed. He was later elected president of the Haverhill common council. In 1898, 1899 and 1900 he was elected to the Massachusetts house of representatives, twice defeating a combination of the Democratic and Republican parties. He was the first Socialist ever elected to political office in New England.

CAREY, Mathew, Irish-American writer and bookseller: b. Dublin, 28 Jan. 1760; d. Philadelphia, 16 Sept. 1839. An address to the Irish Roman Catholics emphasizing the oppression by the penal code brought about his expulsion from Ireland. Later he returned and established *The Volunteer's Journal*. But his radical views invited Parliament's distrust and he was imprisoned until the session was over. He came to the United States in 1788, and in Philadelphia began to publish the *Pennsylvania Herald*. He was subsequently connected with the *Columbian Magazine* and the American Museum. A few years later he became a bookseller and an extensive publisher. When the yellow fever epidemic was especially virulent in 1793, he spent great energy in combating it and wrote a history of the disease. In the same year he founded the Hibernian Society and in 1796, with Bishop White, established the first Sunday-School society. The best known of his political writings was his 'Olive Branch' (1814). It was an effort to promote harmony among political parties during the War of 1812. It passed through 10 editions. In 1819 he published his 'Irish Vindications' and in 1822 'Essays on Political Economy.'

CAREY, Rosa Nouchette, English novelist: b. London 1840; d. 1909. She began writing novels in 1868, and her fictions (of which she wrote nearly 40), in which the literary element is not a very strong feature, were very popular with girls, to whom they were excellently adapted. They include 'Wee Wifie' (1869); 'Wooed and Married' (1875); 'Not Like Other Girls' (1884); 'Uncle Max' (1887); 'Only the Governess' (1888); and 'The Sunny Side of the Hill' (her last novel, 1908), etc.

CAREY, William, English Orientalist and missionary: b. Paulerspury, Northamptonshire, 17 Aug. 1761; d. Serampore, India, 9 June 1834. He was early apprenticed to a shoemaker, and continued to work at his trade till he was 24. With what assistance he could procure he acquired Latin, Greek and Hebrew, and studied theology. In 1786 he became pastor of a Baptist congregation at Moulton, and in 1787 was appointed to a similar situation in Leicester. In 1793 he sailed for the East Indies as a Baptist missionary, but became overseer of an indigo factory. He studied languages and natural history, and collected a rich store of Oriental knowledge. In 1800, in conjunction with Marshman, Ward and others, he founded the missionary college at Serampore; the year following he became professor of Sanskrit, Bengali and Mahratta at the newly-erected Fort William College, Calcutta. In Serampore he had a printing-press for more than 40 different Indian languages, and issued various translations of the Scriptures. His first work was a Mahratta grammar. It was followed by other works, including a Bengali 'Lexicon,' in which he was assisted by Felix Carey, his son. Under his direction the whole Bible was translated into 6 and the New Testament into 21 languages or dialects of Hindustan; and considerable progress was made with the translation of the whole Scriptures into Chinese. He also edited Shroeder's lexicon of the Thibetan language and Roxburgh's 'Flora Indica,' in which a genus of plants which he discovered is named after him, *Careya*. He established an agricultural society at Calcutta, and a botanical garden, at his own expense, at Serampore. For biography consult Culross (London 1882) and Smith, G. (London 1885).

CAREY ACT. See RECLAMATION LAWS.

CARGILL, Donald, Scottish covenanting preacher: b. Rattray, Perthshire, about 1619; d. Edinburgh, 27 July 1681. He was educated at Aberdeen and Saint Andrews, and became minister of the Barony Church in Glasgow in 1655. At the Restoration he refused to accept collation from the archbishop and was exiled beyond the Tay. In 1679 he took part in the battle of Bothwell Bridge, where he was wounded, but succeeded in escaping to Holland. In 1680 he published, along with Richard Cameron, the 'Sanquhar Declaration.' In September of the same year he formally excommunicated King Charles II, Duke of York and other great personages. After avoiding pursuit for several months, in May 1681, he was captured, and at Edinburgh tried and sentenced, and 27 July was beheaded.

CARGO, in law, the entire amount of goods carried by a ship; also, loosely, persons collectively carried by a ship. The term is occasionally applied also to the invoice of the cargo. The bill of lading (q.v.) contains a list of the goods constituting the cargo. The goods on deck, although constituting a part of the cargo, are usually not covered by the insurance policy. The master of a coasting vessel is required by law to keep a record of the goods constituting the cargo, the shippers, consignees and various other particulars, all of which is entered in the cargo book. See FREIGHT.

CARHART, Henry Smith, American scientist: b. Coeymans, N. Y., 27 March 1844. He was graduated at Wesleyan University in 1869, and since then has taught physics and chemistry. In 1886 he was appointed professor of physics at the University of Michigan, where he remained until his retirement as professor emeritus in 1909. Professor Carhart devoted himself largely to the study of electricity, particularly the subject of standard cells and primary batteries, one of the best types of the former having been devised by him and known as the Carhart-Clark cell. He has been a delegate from the United States to several international electrical congresses. He has written 'Primary Batteries' (1891); 'University Physics' (1894); 'Electrical Measurements' (1895); 'High School Physics' (1901); 'College Physics' (1910), and other books.

CARHEIL, kă-rā-ē, **Étienne de**, French Jesuit missionary in North America: d. after 1721. He labored for more than half a century among the Canadian Hurons and Iroquois, and was long stationed at Michilimackinac.

CARIA, in ancient geography, the country forming the southwest corner of Asia Minor, bounded on the north by Lydia or Mæonia, from which it was separated by the Mæander; on the east by Phrygia, on the southeast by Lycia and on the south and west by the Mediterranean. Some confusion, however, exists in regard to its boundaries. Part of it was settled by Greek colonies of Ionians and Dorians, who dispossessed the original inhabitants. It was included in the dominions of Crœsus, King of Lydia, and on his overthrow by Cyrus was transferred to the Persian monarchy, under whose protection a dynasty of Carian princes was established. Halicarnassus was the residence of these sovereigns, among whom were the two celebrated queens, the first and second Artemisia. The progress of the Roman conquests ultimately extinguished the independence of Caria, and about 129 B.C. it was incorporated in the Roman province of Asia.

CARIACO, kä-rē-ä'kō, Venezuela, a seaport in the state of Bermudez, situated to the east of the Gulf of Cariaco, near the mouth of a river of the same name, adjoining a large plain covered with plantations. Its trade is chiefly in cotton and sugar. The Gulf of Cariaco is 38 miles long, from 5 to 10 broad, from 80 to 100 fathoms deep, surrounded by lofty mountains. Pop. 7,000.

CARIACOU, kăr'ĭ-ă-koo, the name given to American deer of the genus *Cariacus*, found in all parts of North America up to lat. 43° N. It is smaller than the common stag, and its color varies with the seasons from reddish-brown to slaty-blue.

CARIAMA, sä-rē-ā'mą, a bird (*Cariama cristata*), a native of Brazil and Paraguay, where its loud scream is a familiar sound on the campos, and where it is domesticated and trained to guard fowls. With an allied Argentine bird (*Chunga burmeisteri*) it constitutes a family (*Cariamidæ*) of great zoological interest, combining as it does characters of the bustards, caracara eagles and cranes, with each of which it has been at times associated. It is larger than the common heron; the plumage is brown, finely waved with darker brown, whitish on the lower parts. It uses its legs rather than its wings in seeking safety. According to W. H. Hudson, the Argentine naturalist, it is of the family of one of the great extinct birds of Patagonia, *Phorophacos inflatus*. Consult *Proceedings Zoological Society of London* for 1889 and 1899.

CARIB, kăr'ĭb, a native American race which attained its highest development in the West Indies. Originating in the valley of the Orinoco, this race spread along the coasts, northward and southward, to a great distance, and especially from island to island of the Lesser and Greater Antilles and the Bahamas. At the time of the discovery of America its language was spoken, with dialectic variations, from the coast of Florida to lower Brazil,— wherever large canoes could carry the swarming, warlike tribes. The Caribs were the vikings of South America. The race name survives in «Caribbean» Sea, «Caribbee» Islands, the word «cannibal,» etc.; the race itself is still well represented at various points in South America. In the West Indies, however, the large native population disappeared rapidly after the Spanish conquest, Caribs and other tribes of the same stock (Arawaks, Lucayos, Boriqueños, etc.), either succumbing under the new conditions or losing their distinctive characteristics by blending with Europeans and Africans. Surviving groups of West Indian Caribs may be studied to-day in the island of Dominica. A few remained in Martinique and Saint Vincent up to the time of the volcanic eruptions in 1902. Great Britain deported 5,000 Caribs from Saint Vincent to the island of Ruatan in the Gulf of Honduras in 1796; thence they migrated to the Central American coast, where their numerous descendants have become a not inconsiderable element in the population of the mainland. In the 'Proceedings of the American Association for the Advancement of Science' (Vol. LI, 1902), Mr. J. Walter Fewkes of the Bureau of American Ethnology calls attention to the different characteristics which the Caribs displayed in different circumstances and localities. Thus the natives in the Bahamas, Cuba, Haiti and Porto Rico were mild, agricultural people who had lost in vigor, while gaining a rudimentary knowledge of the arts of peace, by their sedentary life. On the other hand, constant incursions from the home of the race (the Orinoco region in Venezuela) kept alive the savage customs and ferocious spirit of the Caribs of the Lesser Antilles. Such incursions took place even after the date of the Spanish settlements. The houses of the more peaceful Carib communities did not differ greatly from those of the peasantry in the same regions at the present time. In lieu of clothing, Carib men and girls covered their bodies, as well as their faces, with paint, to protect them from the bites of insects and the heat of the sun. A woven cloth of palm fibre, called *nagua*, — a breech-cloth with long ends,— was worn by the chiefs and the married women. For purposes of decoration, and to distinguish members of one family or community from those of another, designs of animals and plants were painted on the body. Their social organization closely resembled that of the North American Indians, the unit of organization being the clan, ruled by a *cacique* (chief). Combinations were sometimes formed by a number of caciques for mutual defense, and extensive territories were subjected to the control of the more ambitious leaders. Among the insignia of the cacique's rank were the gold disc called *guarim*, worn on his breast, and a stone amulet tied to his forehead. His numerous wives were practically slaves. Ex officio, he was a member of the priesthood. Columbus at first received the impression that the Caribs lacked spiritual insight; longer sojourn among them, however, convinced him that they worshipped many supernatural beings whom they represented by idols, called *zemis*; they had temples for this purpose, in which rude idols were set up to be consulted as oracles by the priests. It is probable that belief in a future life, although not universally held, as some authorities assert, was generally taught by the priests; and it is quite certain that the latter possessed great influence, being physicians to the people as well as ministers to the *zemis.*

Like other savage races of the region from which they came, the Caribs were anthropophagi; yet the evil prominence given to them through the coining of the word *cannibal* (a Latinized form of *Carib*) is not wholly merited. The discoverers, finding a great number of human skulls in the Carib houses, jumped to the conclusion that each skull was the trophy of some revolting feast. In point of fact, the Caribs, being ancestor-worshippers, preserved these relics in honor of defunct members of their family. Consult Adam, 'Le Caraïbe du Honduras et le Caraïbe des Isles' (in *Internat. Amerik.-Kongr.*, Vol. XIV, 1904); Rat, J. N., 'The Carib Language as now Spoken in Dominica' (in *Journal Anthrop. Inst.*, Vol. XXVII, London 1897–98); Koch-Grünberg's 'Die Hiánakoto-Umana' (in *Anthropos*, Vol. III, 1908); id., 'Zwei Jahre unter den Indianern' (Berlin 1909–10).

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CARIBBEAN, kăr-ĭ-bē'an, **SEA**, a part of the Atlantic Ocean occupying a basin 750,000 square miles in area, bounded by South and Central America and the Greater and Lesser Antilles. Its perimeter is wholly mountainous. Mountain folds (continued in submarine ridges from the Greater Antilles to Honduras) mark its limits on the north and south; but the volcanic chain of the Lesser Antilles rises on the east, and the volcanoes of Central America in the remote past formed a wall separating it from the Pacific on the west. Separating it from the Atlantic are steep submarine ridges, of which the Lesser Antilles are the summits. A portion of the broad equatorial stream, which flows from east to west, from the coast of Africa to that of Brazil, enters the Caribbean between the islands at the southern end of the Antillean chain: the waters of this sea, therefore, move from east to west and northwest, and seek an exit through the Yucatan Channel — a passage 120 miles wide between Cuba and the peninsula of Yucatan. On its South American coast are the gulfs of Paria, Triste, Darien, Venezuela, Cariaco; on the west are the Mosquito Gulf and the Gulf of Honduras. But the latter is too small to allow an outflow equal to the inflow into the Caribbean; so that, after the trades have forced the equatorial water into the Caribbean basin, it must remain there a considerable length of time, thus becoming superheated, before it passes into the Gulf of Mexico, where, owing to similar differences between the rate of inflow and outflow, the water becomes still more superheated before passing through the Florida Strait as the Gulf Stream. The main westerly current in the Caribbean, after passing through the Banks Strait, between the Mosquito Reef and Jamaica, is joined by the current of the Windward Channel. The trade-winds, blowing with a steady velocity across the Caribbean region, from east to west, make the surface of this sea much rougher than that of the Gulf of Mexico; they mitigate the tropical heat at all points where their influence is felt; and the moisture they bring from the Atlantic is precipitated in the form of abundant rains against the eastern slopes of the mountains, both on the islands and the mainland. Hence the distinction between «windward» and «leeward» regions, insisted upon especially in the West Indies. The Gulf of Mexico, sheltered behind the Antilles and Yucatan, is practically a «leeward» expanse; but the summer climate of Texas and the great plains is somewhat modified by Caribbean trade-winds.

Recent studies of the Caribbean basin have disclosed its interesting submarine topography — «a configuration which, if it could be seen, would be as picturesque in relief as the Alps or Himalayas. Nowhere can such contrasts of relief be found within short distances. Some deeps vie in profundity with the altitudes of the near-by Andes. . . . Some of the depressions, like the Bartlett Deep, are narrow troughs, only a few miles in width, but hundreds of miles in length, three miles in depth, and bordered by steep precipices. . . . There are long ridges beneath the waters, which if elevated, would stand up like islands of to-day. . . . Again, vast areas are underlain by shallow banks . . . often approaching the surface of the water, like that extending from Jamaica to Honduras. . . . The greater islands and the mainlands are bordered in places by submerged shelves.» (From 'Cuba and Porto Rico': see authorities below). All the islands are, then, to be regarded, from a physiographic point of view, as the «tops of a varied configuration, which has its greatest relief beneath the sea»; and some of these submarine valleys and mountains have yielded a surprising number of animal forms previously unknown. Dredgings in depths of over 2,000 fathoms have brought to light new species of crustacea, and forms resembling the fossils of past geological epochs are taken alive in those profound marine valleys. Many phosphorescent creatures are found; in certain places «dense forests of pentacrini undulate on the bottom like aquatic plants»; on the submerged banks and in the shallows, coral polyps and mollusks are employed as actively now as ever, in extracting the lime carried in solution by the sea-water, to build its shells and corals which are so large a part of the rock-making material in all this region, from Yucatan to Porto Rico. The most important marine highways for Caribbean commerce are those on the north: the Windward, Anegada and Mona passages and the Yucatan Channel. The Caribbean has attained a new importance since the completion of the Panama Canal. It is now traversed by several world trade-routes directed to the Pacific through the canal. The United States has a naval base at Guantanamo Bay, Cuba; the British have bases at Bermuda and Jamaica; the Virgin Islands acquired by the United States from Denmark in 1916 and occupied 31 March 1917, form another naval base for the defense of the canal. Several steamship lines make winter cruises from New York. (For the origin of the name, see CARIBS). Consult Agassiz, 'The Gulf Stream' (in annual report Smithsonian Institute to July 1891, Washington 1893); Hill, of United States Geological Survey, 'Cuba and Porto Rico' (1898).

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CARIBBEAN, American Interests and Diplomatic Relations in the. The United

States has had a long historical interest in the Caribbean and its problems. This interest was early expressed by the long struggle to obtain trade with the British West Indies, the western desire for a trade outlet at the mouth of the Mississippi, the sympathy for the Spanish colonies in their struggle for independence and the American annexation of territories fronting on the Gulf. In the decade and a half after 1845 its continuation and increase was indicated by the Panama transit treaty with Colombia (then New Granada) in 1846, the ship canal agreement with Nicaragua in 1849, the famous Anglo-American Clayton-Bulwer treaty of 1850, a series of negotiations for the acquisition of Cuba and certain West Indian naval stations and various efforts to prevent the danger of European interference in Central America and the West Indies. In the Civil War American attention was attracted toward the Caribbean by the problem of blockading Confederate ports against blockade runners operating from certain West India bases; and after the war, the earlier propositions for greater influence in the region were kept alive by the memory of the difficulties and limitations of the American navy in maintaining the blockade of the Confederate ports, and also by the unsatisfactory conditions of Spanish rule in Cuba.

The Spanish-American War, resulting in the American possession of Porto Rico and the assumption of new international duties in Cuba, brought the vision of new economic and political advantages in the Caribbean and the realization of new responsibilities. The development following the war revolutionized the American national position. By the logic of events the United States was forced into a place of increasing importance in international leadership in the Caribbean. The construction of the Isthmian canal under American control, the logical conclusion of a long series of events and the immediate result of a wise diplomacy and policy which terminated a long period of irritating discussion and delay, attracted the attention of the United States to the necessity of larger responsibilities in the development of the Caribbean tropics to serve the world's needs.

Under the administrations of Roosevelt, Taft and Wilson, the general policy of the American government toward Caribbean countries was fundamentally the same in the assumption toward weaker neighbors of increasing responsibilities which might involve intervention to keep order. A positive policy, preventative rather than remedial, gradually supplanted the former negative or passive policy which involved intervention only after a wrong was done. In 1903, under President Roosevelt, the government extricated Venezuela from a humiliating experience with Germany and other European powers. In 1905 it assumed control of customs collection in the Dominican Republic, and soon thereafter exercised its treaty right to interfere in Cuba to preserve order. Later, under President Taft, it actively intervened to terminate a revolution in Nicaragua, and negotiated with Nicaragua and Honduras treaties for the extension of agreements similar to the one in force in the Dominican Republic. Later, under President Wilson, it retained forces in Nicaragua for the preservation of order, and sent a force of American officials to the Dominican Republic to supervise the elections, and (in 1916) ratified convention arrangements for establishment of fiscal protectorates over Nicaragua and over Haiti. In 1917 the policy of increased police duties in the Caribbean also resulted in the acquisition of the Danish colonies.

The object lesson of Porto Rican development under American control, and of American supervision in Cuba and San Domingo — a practical demonstration that public order and security of life and property is an essential condition for economic development — has made a deep impression upon all Caribbean peoples.

As a result of the construction of the Panama Canal, the international importance of the Caribbean has greatly increased by the development of new trade routes which will make it the trade centre of the American tropics — the cross-roads of the western world; and the United States more than any other great power is concerned in the political ownership of the territory, the fiscal policies of their governments, the extent and direction of their foreign trade, the problems arising from the peculiarities of their population, their financial status, the exploitation of their natural resources, their foreign investments, the protection of health, and other problems which have a bearing on foreign policy and necessitate more intimate American relations with these communities.

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CARIBBEE, kă-rĭ-bē', or **SAINT LUCIA BARK,** a bark sometimes substituted for cinchona (q.v.), though not containing its characteristic alkaloid. It is procured from the *Exostemma Caribæum*, a tree growing in the West Indies. This bark is in convex fragments, covered with a yellow epidermis and has a very bitter taste and very faint smell.

CARIBBEE ISLANDS, a name commonly given to that portion of the chain of Lesser Antilles between the Virgin and South American groups. See ANTILLES.

CARIBE, any of a group of small, robust, voracious fishes, often of singular form, and allied in structure to salmon, which abound in South American tropical rivers. They have numerous teeth, well fitted to biting out pieces of flesh, and instantly seize upon any disabled or soft-bodied creature in the water and devour it or worry it. Hook-and-line fishing is almost useless where these little bandits are numerous, as they rob the hooks of bait, or tear to pieces anything caught before it can be lifted out of their reach. They will even attack and badly wound human bathers. One of the best known and most dreaded is the piraya of the Amazon, which is said to come in crowds wherever blood is shed in the water. These fishes constitute the sub-family *Serrasalmoninæ*, of the family *Characinidæ*, and are intermediate between the cyprinoids and the salmonoids. A distinguishing characteristic is the fact that the abdomen is serrated with sharp spines. Consult Gunther, 'Introduction to the Study of Fishes' (Edinburgh 1880).

CARIBOU, kă-ri-boo', the name of two or more species of reindeer inhabiting Canada, which are of great importance as a source of food and clothing to the natives of Arctic and sub-Arctic regions, and also are of much interest to sportsmen. The caribou is so completely a reindeer (q.v.) that there seems little practical reason for separating it specifically from that of Europe, whence no doubt it came by migration in early Pleistocene time; and still less for the division of this very variable deer into the many species and subspecies that have been described "by those who believe that the infinite variations of nature must be followed by an infinity of names." It will be convenient, nevertheless, to follow the general practice and recognize two groups — the Arctic or Barren-Grounds caribou (*Rangifer arcticus*), and the Woodland caribou (*Rangifer caribou*).

The Arctic caribou is to be found from Greenland to Alaska wherever tundras and a few plains exist north of the limit of tree-growth, and on all the islands of the Polar Sea. This is in summer, when herbage springs up along the coasts and watercourses, and reviving lichens and mosses furnish abundant fare. The does and fawns scatter in little parties by themselves at this season, separated from the widely wandering stags. Their coats are gray or light brown, varying locally, and the summer-coat is acquired in July when the old winter-coat is shed. This new summer hair is long and soft, and is white at the roots, but tinted toward the end. As it grows and thickens the hair becomes brittle, the white base lengthens as fast as the brown tips wear or break off, and finally the color of the coat disappears and it is virtually white all over the body. Thus is acquired the white winter-coat characteristic of this species. As autumn approaches these caribou gather toward the south from the outlying coasts and islands, until huge herds are brought together and travel south to the northern edges of the Canadian forests, in whose shelter they pass the winter, shedding and renewing their antlers at that season. In the spring they go north as soon as the snow permits.

These semi-annual migrations are the harvest times of the Eskimos and northern Indians, and a successful attack on a helpless herd provides them with a supply of flesh and useful materials that ensures a comfortable winter; but the slaughter has been so inconsiderate that even on the Barren Grounds these herds are now small and scattered as compared with a century ago, and local famines are more and more suffered, or districts have been permanently abandoned by the inhabitants in consequence. Every edible part of the animal, even to the entrails and marrow of the bones, is eaten. From the bones and horns various implements are made, while the hide furnishes the best of clothing and bedding. The Arctic folks are as dependent on their caribou as are the desert-people on the camel.

The Woodland caribou has never been so necessary, although always valuable, to the Indians of central and southeastern Canada, except perhaps in Labrador, because there was plenty of other game. This species is in general of larger size and darker color, and has heavier antlers with more points, than the Arctic species just described. It is variable in all respects; and two or three forms from the Rocky Mountains and westward have been called separate species; but the distinctions are obscure. The largest specimens recorded come from southwestern Alaska. This species avoided the open plains, but in summer once roamed through all the wooded region of Canada south to the Great Lakes and central New England. It is now to be seen in the United States only in northern Maine and along the rough northern border of Minnesota, and in Canada has been so threatened with extinction that it has long been protected by law. This decrease is owing mainly to the acquirement of fire-arms by all the Indians of the interior, and to the extension of settlements far toward the north; but it is largely due, also, to the work of sportsmen. To these men caribou hunting in autumn and early winter yields sport of a high order. This deer, sensitive in sight, hearing and smell, and exceedingly wary, affords an object of stalking-tactics so difficult as to make the getting within rifle range of, and finally obtaining, a "good bead," a feat to be proud of. An easier and more deadly way is to track and overtake a band on snowshoes, but this also requires great skill and endurance, and good shooting. The writings of sportsmen-travelers in all parts of Canada and Alaska abound in narratives of this sport, and describe the habits of this fine deer. Consult Elliot, 'The Deer Family' (in 'Sportsman's Library,' New York 1902); Ingersoll, 'Life of Mammals' (New York 1909); Seton, 'Northern Mammals' (New York 1909); Tyrrell, 'Report Canadian Geological Survey for 1896' (Ottawa 1897).

ERNEST INGERSOLL.

CARICA (from caría, a district of Asia Minor, whence it was supposed to have come), a genus of plants, the typical one of the order of Papayads (*Papayaceæ*). See PAPAW.

CARICATURE AND CARICATURISTS. A tendency to burlesque and caricature is a feeling deeply implanted in human nature, and it is one of the earliest talents displayed by people in a rude state of society. An appreciation of, and sensitiveness to, ridicule, and a love of that which is humorous, are found even among savages, and enter largely into their relations with their fellow-men. When, before people cultivated either literature or art, the chieftain sat in his rude hall surrounded by his warriors, they amused themselves by turning their enemies and opponents into mockery. They laughed at their weaknesses, joked at their defects, whether physical or mental, and gave them nicknames in accordance therewith,— in fact, caricatured them in words, or by telling stories which were calculated to excite laughter. When the agricultural slaves were indulged with a holiday from their labors, they spent it in unrestrained mirth. And when these same people began to erect permanent buildings, and to ornament them, the favorite subjects of their ornamentation were such as presented ludicrous ideas. The warrior, too, who caricatured his enemy in his speeches over the festive board, soon sought to give a more permanent form to his ridicule, which he endeavored to do by rude delineations on the bare rock or on any other convenient surface which presented itself to his hand. Thus originated caricature and the grotesque in art. In fact, art itself, in its earliest forms, is caricature; for it is only by that exaggeration of feature which belongs to caricature that unskilful draughtsmen could make themselves understood. The field of the history of comic, satiric literature and art is very large, and many nations, ancient and modern, Egypt, Greece, Rome, India, pagan and Christian are represented. During the period of transition from antiquity to the Middle Ages, the Roman *mimi* continued to exist, and the evolution of the religious and secular caricature of the period and of the caricatures preceding the Reformation was associated with the *mimi* performers who sung songs and told stories, accompanied with dancing and music, an ever-popular form of amusement. In the 4th century Saint Augustine calls these performances *nefaria*,—detestable things—and says, that they were performed at night. The songs as they are called continued to consist not only of general, but of personal, satire and contained scandalous stories, frequently accompanied by rough illustration or caricature, of persons living and well known to those who heard and saw them. The Reformation and Puritan periods furnish many amusing and historically illuminative specimens of caricature, domestic and political, as represented in the Flemish school of Breughel, the Italian school of Salvator Rosa and the French school of Callot of the 16th century. The commanding figure of the 17th century in caricature is William Hogarth, the Englishman, whose new style of design raised him to a degree of fame as an artist few men have ever attained. A little known fact is that Benjamin Franklin, the friend of Hogarth, to whom the dying artist wrote his last letter, also was a capital caricaturist, and used his skill in this way as he did all his other gifts and powers in behalf of his country and his kind. James Gillray was the prominent figure in English caricature in the latter half of the 18th century, Gavarini in France; George Cruikshank and John Leech in England were the noted caricaturists of the early part of the 18th century. The two great cartoonists of recent times have been Sir John Tenniel and Thomas Nast, the former being to all Europe what the latter was to all America, and in connection with these two can be said all that need be said of caricaturists of our time. True, Nast was practically alone in his field, and he did not work as long as did Tenniel, still, to judge him at his best, though the period was comparatively short, he stood high as a picture-maker of that class. Nast was as brave as his subject, Tweed, the New York city boss, was crooked, and the two furnished the best series of caricatures by far that have ever been seen in this, or, it might be said, in any other country. Nast, however, was not the draughtsman that Tenniel was, but what he lacked in artistic finish he made up in power and force of expression.

Since the day of Tenniel and Nast, caricaturing seems to have fallen into less virile hands. Tenniel and Nast each drew a caricature once a week, while now caricaturists draw seven or eight in that time. Formerly the best caricaturists were employed on the weekly papers, while now the better class are employed on the great dailies. But the times have brought this about, not necessarily the caricaturists. Workingmen have no time to read, and a picture which may tell all at a glance means more to them than the ablest editorial that the combined editors of the country could write. A picture can be understood by all, whereas we have many languages and we speak but few, and read fewer. Words we forget, but pictures stay, filed away in our minds, and we refer to them on a moment's notice. Every day, as the pace quickens, and the press for time increases, we find our time for reading diminishes, thus the moving-picture excels the finest description ever written of the same thing.

We sometimes see so-called comic art, which is not comic, and that called caricature which is not true caricature. A man who draws a picture of a man with a broad grin and winking with one eye, or cross-eyed, or perhaps a man standing with one foot on his other, is not necessarily a caricaturist any more than is the man who puts big feet and big noses on every person he draws. A young caricaturist who had submitted a picture to a critic for his judgment and had received a severe lecture on the bad drawing it displayed made an attempt to hide behind the fact that it was a caricature, and therefore shouldn't be considered as the critic was considering it. Whereupon he replied: "No, never try to hide behind that. Remember one thing: that poor drawing is not caricature, and another, that all the bad artists in the country are not caricaturists. On the contrary, those who exaggerate the salient features must draw them even better, as more attention is called to a big nose or large ears if they are made conspicuously large, than would be the case otherwise."

But there is something else that a successful caricaturist must possess. That one thing, whatever it may be called, is of more importance than the art of drawing properly, and is a certain force of character, or of individuality which at once suggests strength of purpose and power. It can convey the feeling of sadness, of brute force, or excruciating mirth, yet many very fine draughtsmen who are styled caricaturists never draw with that spirit predominant, and without it their productions are not true caricatures.

Thus, in trying to be caricaturists, such men are robbed of the chance of being serious illustrators, in which work they might succeed; and they never succeed as caricaturists.

There are three kinds of good caricatures: First, the strong, powerful, almost brutal; second, the humorous, the one instantly compelling laughter; and last, but not the least in effect, the pathetic; a picture capable of causing men to weep. The most effective are the powerful and the pathetic. The humorous is indeed attractive, if not overdone, but you soon forget its meaning. It can attack any and all things, from the weather to the President, without offense. But the most effective caricature is one that the subject of it would rather you would not print. Probably none can be made more powerful than the pathetic when it is timed and tempered just right, as its appeal to the sympathy is the surest way to the emotions. No caricaturist ever drew a caricature that would cause people to shed tears on seeing it, unless the artist shed tears when he drew it, any more than one could draw an angry political boss unless at the time of drawing one wore the same angry and hateful expression on one's own face. So with the humorist. One must wear a broad smile when he draws a man laughing, unless one is drawing him from life; and unless one is smiling when drawing smiling people, the subjects will seem to look and laugh only in mechanical fashion.

If the caricaturist is strong enough in his line to be called one, the first person he wins is himself. Once he has settled in his own mind that he is working for a just cause, it will be noticed at once that his work improves, and if he continues to study and put his heart and soul into it, others will be converted and he will acquire a following. If a cartoonist in his politics keeps side by side with his pictures he will be much more of a caricaturist than one who will work on a Democratic paper one day and the next on the Republican side. A young man in starting out should study and choose for himself and in that way he will find that he can lend more power and force to his work. It would be hard to imagine Thomas Nast being in private life a sympathizer with Tweed. The difficulty with caricaturists is that they are sometimes like the politician after the election, when he says: «No wonder the other side won; 'they bought us.'» What interest could one take outside of the mechanical reproduction if one knew that the caricaturist who had one year drawn powerful caricatures for one party would turn around the next year and work for the opposition. The power of a caricature becomes power only when the reader of the picture is convinced that that which is represented in the picture really did happen, and that cannot be done by a caricaturist if one day he is with the poor, and the next day with the rich; or in the same relation with any case that comes up.

The late John J. Ingalls said that the caricature did harm that good might follow. Caricatures, to be effective, should be founded on fragments of truth, though you are permitted to dig below the frost line. Without truth at the bottom they are powerless, and with truth at the bottom they are powerful and everlasting. Though Tweed, the man, is dead, Tweed, in the caricature, still lives, a prisoner in stripes, with ball and chain to his leg. A good caricature may be called an exaggeration of the truth. In these times there are great opportunities for the cartoonist. The billionaire will have to deal kindly and justly with his fellowmen, or else he will be more of a target than ever before, but the honest man need never fear a caricature; on the contrary, he can laugh and go about his business, and if he is attacked, the attacks will react in his favor. But they cannot be recommended as the steady diet for a dishonest person, since whether he has a conscience or not, if they don't bring him to justice they will give him many a sleepless night.

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CARIES, kăr'ĭ-ēz, a form of local death in bone, due to a variety of agents. Caries is usually distinguished from necrosis, another type of local death in bone, by the slower disintegration of the bone affected by the carious process. Necrosis usually results in the death of large pieces of bone, with the formation of sequestra. Caries is a gradual disintegration without sequestration. Caries is the result of inflammation of the softer tissues in the bone spaces, and is due usually to some definite form of irritant. It may be that of a gas, such as chlorine, or phosphorus, the latter causing in match-works a form of caries of the jaw; but bacteria of tuberculosis and syphilis are the most frequent causes. Tuberculous caries is the most frequent form of the disease. See Hip Joint Disease; Tuberculosis. For caries of the teeth, see Teeth.

CARIGARA, kā-rē-gä'rạ, Philippines, a town of the province of Leyte, situated on the north coast of the island, 22 miles west of Tacloban. It has a harbor formed by a bight extending 11 miles inland, carries on a considerable coast trade and is an important hemp port. Pop. about 16,000.

CARIGNANO, kā-rēn-yä'nō, Italy, a city in the province of Turin, 11 miles south of the latter on the left bank of the Po. It is surrounded by old walls, and has a handsome square ornamented with arcades, some fine churches, some silk-spinning mills and sugar-refineries. From this town is named a branch of the house of Savoy. Pop. 7,000.

CARILLON, kā-rē-yŏṅ, a kind of chime, played either by hand or clockwork on a number of bells, forming a complete series or scale of tones or semi-tones, like those of the organ or harpsichord. See Chimes.

CARIMATA, kä-rē-mä'tạ, or **KARIMATA,** a name applied to the strait between Borneo and Billiton; also to a cluster of a hundred islets and reefs (area, 57 square miles; pop. 500) in that strait; and lastly, to the principal member of the group, whose highest point reaches 2,600 feet, and is in lat. 1° 36' S. and long. 108° 54' E.

CARINI, kā-rē'nē, Italy, city in the province of Palermo, island of Sicily, 17 miles northwest of the city of Palermo. It is beautifully situated four miles from the sea, in a fertile region. It has a Gothic castle of the 14th century. In the vicinity are caves in which animal fossils are found. The Sicilian revolutionists were defeated here, 18 April 1860, by the Bourbon troops. North of the town was the ancient Hyccara, from which the Athenians carried off the 12-year-old Laïs, who grew up to be so famous a courtesan. Fishing is the chief occupation. The district produces much corn and wine. Pop. about 14,000.

CARINTHIA (Ger. Kärnthen), a duchy and crownland, between lat. 46° 24' and 47° 7' N., and long. 12° 35' and 15° 10' E., bounded on the north by Salzburg and Styria, on the east by Styria, on the south by by Carniola and on the west by Italy and Tyrol; area, 3,986 square miles. It is extremely mountainous, generally sterile, and one of the most thinly populated provinces of Austria. The arable land does not exceed 290,000 acres, but there are some fertile valleys, and a considerable extent of rich pasture land. It has several rivers and lakes. Of the former the principal is the Drave. All of them abound with fish. The country does not yield corn enough for the consumption of the inhabitants, who import the deficiency from Hungary. The cereals most extensively cultivated are rye and oats. Some wine is produced in Lower Carinthia, but it is of inferior quality. Cattle, sheep and horses are raised in considerable numbers, but the mines of Carinthia are the main sources of its wealth. The chief of these are lead, iron and calamine. Various kinds of gems are met with. Its operative industry is chiefly confined to the working of its metallic ores, though there are also manufactories of woolens, cottons, silk stuffs, etc., most of which are in Klagenfurt, the capital. Bessemer steel rails, wire, wire nails and bar-iron are produced in great quantities. Some machinery, firearms, textiles, leather goods, cement and wood pulp are exported. Klagenfurt is the centre of the railway lines, of which there are about 385 miles. The Diet consists of 37 members and the crownland sends nine members to the Lower House of the Austrian Reichsrat. The principal towns are Klagenfurt and Villach. Carinthia formed part of the empire of Charlemagne, and afterward belonged to the dukes of Friuli. It subsequently passed through various hands, and finally became an appendage of the Austrian Crown in 1321. In 1809 it was annexed to the empire of Napoleon, but was restored to Austria in 1814. Nearly all the inhabitants are Roman Catholics. The population of Klagenfurt, the capital, is 24,284; that of the crownland 396,200.

CARINUS, Marcus Aurelius, Roman Emperor: d. 285 A.D. He was the elder of the two sons of the Roman Emperor Carus, who conjointly succeeded to the throne on the death of their father, 284 A.D. His brother was supposed to have been murdered on his return from the East, and Carinus, ruling alone, became one of the most profligate and cruel of the Roman emperors. The soldiers having rebelled and proclaimed Diocletian emperor, Carinus collected the troops that were in Italy and marched into Mœsia to meet Diocletian and quell the revolt. A decisive battle was fought near Margus, in which Carinus gained the victory, but in the moment of triumph he was slain by one of his own officers, whom the vices of the Emperor had outraged.

CARIPE, kä-rē′pā, Venezuela, town situated in a valley in the northern part of the province of Bermudez. It was formerly the headquarters of the Capuchins, and contains the ruins of their church cloister. In the vicinity is the large cave described by Humboldt (2,800 feet from front to back and from 70 to 80 feet high) in which lives the bird known as guacharo, a kind of nighthawk. Pop. about 5,000.

CARISBROOKE, England, a village pleasantly situated near the centre of the Isle of Wight, and overlooked by the ruins of its ancient castle, where Charles I was imprisoned 13 months, previous to his trial and execution. The castle and grounds cover 20 acres. Within the walls is a well 200 feet deep. The parish church of Saint Mary is a venerable structure, with a fine perpendicular tower containing a chime of bells. It was formerly attached to a Benedictine priory founded under William the Conqueror, but the priory no longer exists. In 1859 a Roman villa was discovered at Carisbrooke, and the place seems to have been a fortress at the time of the Roman occupation. Pop. 5,139.

CARISBROOKE, MARQUIS OF. See BATTENBERG, PRINCE HENRY MAURICE.

CARISSIMI, kä-rēs′sē-mē, **Giacomo,** Italian composer: b. Marino 1604; d. Rome, 12 Jan. 1674. In 1624–28, he was Kapellmeister at Assisi, and then became musical director of the church of Saint Apollinaris in Rome, and continued in that position until his death. He wrote many oratorios, cantatas and motets, and has been praised for his characteristic expression of feeling and his easy, flowing style. He deserves most honor for the improvement of the recitative, having given it a more expressive and natural language, and he greatly developed the sacred cantata. His oratorio ‹Jonah› has been revived in recent times. It anticipates in the descriptive passages some of the effects since elaborated by the modern classical composers, and it is altogether distinguished by freedom, boldness and striking antiphonal imitations. Other works are ‹Jephthah›; ‹Judicium Salomonis›; ‹Baltazar›; ‹Jonas› (in Vol. II of Chrysander's ‹Denkmäler der Tonkunst› 1856); ‹Motets› (1664 and 1667); ‹Masses› (1663 and 1667); ‹Arie da camera› (1667); and ‹Ars Cantandi› (3d ed. 1696). As a teacher Carissimi was greatly esteemed, Alessandro Scarlatti, Buononcini, Cesti, Kerll, Krieger and Charpentier being among his pupils.

CARL, William Crane, American organist: b. Bloomfield, N. J., 2 March 1865. He was educated in Paris under Alexander Guilmant; received the degree of Mus.D. from the University of New York 1911 — Officier de l'Instruction Publique, and member of the French Academy of Music (conferred by the French government). He is organist and musical director of the old First Presbyterian Church, New York, and has given over 150 free organ concerts there; is director of the Guilmant Organ School, New York; inaugurated many of the large organs in America, including a series in Dawson City (Klondike); has appeared with the leading orchestras at expositions, and at music festivals. He toured Japan and made successful study of the music of the Orient. Author ‹Masterpieces› (1898); ‹Ecclesiæ Organum›; ‹Festival Music for Organ› (5 vols.); ‹Master-studies›; ‹Novelties for Organ› (2 vols.); also anthems, songs and articles on musical subjects. A founder of the American Guild of Organists; membre de l'Alliance Française; member of the National Association of Organists and Fraternal Society of Musicians.

CARLÉN, kär-län′, **Emilia Smith Flygare,** Swedish novelist: b. Strömstad, 8 Aug. 1807; d. Stockholm, 5 Feb. 1892. In 1827 she married a physician named Flygare. In 1838 she published her first novel, ‘Waldemar Klein,’ and among the best of her subsequent works are the ‘Professor’ (1840); ‘A Year’ (1846); ‘The Brother's Bet’; and ‘The Guardian’ (1851). Several of her novels have been translated into English. After his death in 1833, she decided to devote herself to literature. In 1841 she married J. G. Carlén, a lawyer and poet. After his death in 1875, her literary activity ceased altogether, although her salon had been the centre of literary life at the capital. In 1878 she published a volume of ‘Reminiscences of Swedish Literary Life.’ She had clear insight into the conditions of human life, especially of life in the middle class, and she describes it with admirable fidelity. Characteristic are ‘Gustav Lindorm’ (1839); ‘The Rose of Tistelön’ (1842); ‘The Maiden's Tower’ (1848), all translated into English. Consult Svanberg, ‘E. F. Carlén’; ‘En studie’ (Stockholm 1912); Schoeldstroen, ‘E. F. Carlén’ (ib. 1888).

CARLETON, Guy, 1st Lord Dorchester, British general and colonial governor: b. Ireland 3 Sept. 1724; d. Maidenhead, England, 10 Nov. 1808. He served under General Amherst at the second siege of Louisburg 1758, and under Wolfe in 1759 at Quebec, where he was wounded. In 1762 he greatly distinguished himself in the British attack on Havana. Sent out as lieutenant-governor of Quebec in 1766, he remained closely identified with Canada for well-nigh 40 years. He inspired the Quebec Act (1774); when the Revolutionary War broke out he was commander of the British army in Canada, defended Quebec with great skill, and, reinforced by a British squadron in May 1776, forced Benedict Arnold's army to retire. In 1782 he became commander-in-chief of the British army in North America and during his command peace was finally concluded. Again appointed governor of Quebec in 1786 he was soon rewarded with a peerage as Baron Dorchester. He helped to frame the Constitutional Act of 1791, which divided Canada into two provinces. He remained at Quebec until 1796, and died in England in 1808, aged 84. By defeating Arnold's attack on Canada, Carleton really saved British North America to Great Britain. He was a stern but humane officer, and was especially loved by the newly-conquered French whom he ruled in Canada.

George M. Wrong.

CARLETON, James Henry, American soldier: b. Maine 1814; d. San Antonio, Tex., 7 Jan. 1873. In February 1839 he took part in the «Aroostook War,» relative to the northeast boundary of the United States, and later was commissioned 2d lieutenant in the 1st United States Dragoons. In 1846 he took part in Kearny's expedition to the Rocky Mountains, served on General Wood's staff in the Mexican War, received the brevet rank of major for gallantry at Buena Vista; and later was chiefly employed in exploring expeditions and against hostile Indians. In 1861 he was ordered to southern California, raised the famous «California column,» and marched across the Yuma and Gila deserts to Mesilla on the Rio Grande. As commander of the Department of New Mexico he was active in a number of severe engagements. For his services he was brevetted major-general, 13 March 1865; became lieutenant-colonel of the 4th Cavalry, 31 July 1866; and was promoted colonel of the 2d Cavalry, June 1868, and ordered with his regiment to Texas. He wrote ‘The Battle of Buena Vista’ (1848).

CARLETON, Mark Alfred, American grain expert: b. Jerusalem, Ohio 1866. After studying at the Kansas Agricultural College he was appointed in 1894 cerealist in the United States Department of Agriculture. In 1898–99 he proceeded to Russia and Siberia to investigate agricultural conditions, and on his return introduced among several other new crops durum wheat. Durum wheat has now taken the place of the soft spring wheat varieties in Texas, Nebraska, Oklahoma and Kansas, with an annual yield estimated at $40,000,000. His writings, chiefly bulletins of the United States Department of Agriculture, include ‘Cereal Rusts of the United States, 1899’; ‘The Basis for the Improvement of American Wheats’ (1900); ‘The Commercial Status of Durum Wheat’ (1904); ‘Barley culture’ (1908); ‘Ten-Years experience with Swedish Select Oat’ (1910); ‘Winter Eymper’ (1911).

CARLETON, Thomas, English soldier and administrator: b. Newry, County Down, Ireland, 1735; d. 1817. He entered the 20th Regiment in his 18th year, was present at the battle of Minden and served in Canada under his brother, Sir Guy Carleton, during the American Revolutionary War. He was first governor of New Brunswick, 1784–1817. In his administration of that province it was said that he showed «a generous contempt of his own private wealth, and an exact frugality in the management of that which belonged to the public.»

CARLETON, Will, American poet: b. Hudson, Mich., 21 Oct. 1845; d. 1912. Soon after his graduation at Hillsdale in 1869, he traveled widely as a lecturer in the northern and western states, Great Britain and Canada. He is best known in literature by his ballads of home life, many of them having gained great popularity. His books include ‘Poems’ (1871); ‘Farm Legends’ (1875); ‘City Ballads’ (1888); ‘City Legends’ (1889); ‘City Festivals’ (1892); ‘Rhymes of Our Planet’ (1895); ‘The Old Infant, and Similar Stories’; ‘Young Folks' Centennial Rhymes’; ‘Songs of Two Centuries’ (1902); ‘Drifted In’ (1908); ‘A Thousand Thoughts’ (1908). He was also for a time editor of *Everywhere,* an illustrated magazine.

CARLETON, William, Irish novelist and short-story writer: b. Prillisk, County Tyrone, 20 Feb. 1794; d. Sandford, 30 Jan. 1869. His father was a farmer on a small scale. The son, intended for the priesthood from a tender age, spent his boyhood in pursuit of an education, and managed, in spite of difficulties, to acquire a fairly creditable one. With no other equipment, and without a penny in his pocket, he set out on foot from his native county, at about the age of 24, to seek his fortune, for he had long abandoned all ambition for the sacerdotal dignity. Arrived in Dublin, he decided to change his religion, and he became a member of the Established Irish Protestant Church. He subsisted for a time on some tuitions, and when he obtained a clerkship, with a salary of £60 a year, in the Sunday School Society, he thought that he was provided for for life. On the strength of this clerkship and the income derived from some evening tuitions, he married Jane Anderson, his faithful and loyal companion for the remainder of his life; but before his first child was born he was ousted from his position in the Society. A period of schoolmastering, first at Mullingar and afterward at Carlow, followed; but he eventually gravitated back to Dublin. At that time (1828), the United Kingdom was rocked to its base by the climax of the agitation for Catholic Emancipation. The Evangelicals, an aggressive party which had taken the Church of Ireland under its special protection, were then powerful in Dublin. For the propagation of their views they had a monthly publication, *The Christian Examiner,* and to this magazine Carleton was invited to contribute stories and sketches based on the superstitions of the Catholic Irish peasantry, a subject with which he was thoroughly acquainted. He made his first appearance in its pages in April 1828 with the first part of 'A Pilgrimage to Patrick's Purgatory,' in which several Catholic tenets and practices were savagely ridiculed. He continued to write for the *Examiner,* along much the same lines until December 1831. In the meantime, he brought out, in 1830, the first series of his inimitable 'Traits and Stories of the Irish Peasantry,' and he followed this up, in 1833, with the second series. Both collections are brimful of humor and pathos, the second containing, among other pieces, 'The Poor Scholar' and 'Tubber Derg,' two of the finest things he ever wrote. For some years Carleton contented himself with producing short stories and sketches, so that it became a by-word among his friends that a long novel, with an intricate and sustained plot, was beyond his range. 'Jane Sinclair' (1836) did not do much to dissipate this belief, but when 'Fardorougha the Miser' came out in 1837-38, it became evident that a new star had risen above the literary horizon. This pathetic novel excels in the portraiture of the vice of avarice: Fardorougha has been compared, and not unfavorably, with Molière's Harpagon in 'L'Avare' and with Balzac's Père Grandet in 'Eugénie Grandet.' In Honor O'Donovan Carleton has presented to us one of those heroines in humble life in whose delineation he admittedly excels.

The success of the *Nation* newspaper, founded in Dublin in 1842, gave a new direction to Carleton's thoughts. Hitherto his attitude had been, on the whole, one of satirical censure on the religion of the great majority of his fellow-countrymen and of more or less open hostility to Irish national aspirations. He now saw that, if he wished to be popular, he must espouse the popular side. Accordingly, in 'Valentine McClutchy' (1845), he made a regular right-about-face, and let himself go, almost without restraint, in attacking Orangeism, the Grand Jury system, the methods by which the Union was carried, the Charter Schools, absentee landlords with their conscienceless agents, the corruptions of Irish Protestantism, and even the practices and pursuits of the Evangelical party. 'Valentine McClutchy,' although loosely constructed, is yet instinct with the power of genius. Two of its characters, Solomon McSlime, the hypocritical attorney, and Darby O'Drive, the apostatizing bailiff, are great original creations. This was Carleton's most prolific period. In rapid succession work after work flowed from his pen: 'Art Maguire,' 'Tales and Stories of the Irish Peasantry' (not to be confused with 'Traits and Stories'), 'Rody the Rover,' and 'Parra Sastha.' In 1846 he wrote 'The Black Prophet,' one of his best works, with two wonderfully contrasted heroines. This was followed in 1847 by the pathetic 'Emigrants of Ahadarra.' 'The Tithe-Proctor' (1849) showed another kaleidoscopic change. It gave mortal offense to many of his readers, both from the stand it takes regarding the Anti-Tithe War of the thirties, and from the aspersions deliberately cast in the preface on the character of the Irish people and the popular movements of the forties. 'The Squanders of Castle Squander' (1852) is also full of rancorous and bitter political and religious discussion. He is seen to greater advantage in 'The Black Baronet,' originally published in 1852 as 'Red Hall.' This is a story depicting love, ambition, and revenge, and has a most intricate and baffling plot, not discoverable until the very end. One of its great characters is Father MacMahon, the prototype of many of those clerical oddities who have since contributed to the gaiety of nations. The popularity, which Carleton won with 'Valentine McClutchy' and lost with 'The Tithe-Proctor,' he regained in full measure with 'Willy Reilly and his dear Colleen Bawn' (1855). The scene is laid in the days of the Penal Laws, and the obvious sympathy displayed with the cruelly oppressed Catholics restored the author to the affections of his warm-hearted and forgiving fellow-countrymen. The novel itself is poorly constructed, and the plot hinges on a series of improbabilities, but its subject has made it the most popular of Carleton's works. Other novels are 'The Evil Eye' (1860), 'The Double Prophecy' (1861), and 'Redmond Count O'Hanlon, the Irish Rapparee' (1862). Carleton wrote some verse and one play. His verses are generally of a pensive and meditative cast. His best and best-known poem is the ballad 'Sir Turlough, or the Churchyard Bride' (1830), which has been pronounced the most successful legendary ballad of modern times. His solitary play, 'The Irish Manufacturer, or Bob Gawley's Project,' produced at the Theatre Royal, Dublin, in March 1841, was not a success, and was withdrawn after a few nights. On some of his novels plays have been founded by other hands, and several of his books have been translated into French and German. From the time of his return to Dublin in 1828, Carleton's life was singularly uneventful. He was a devoted husband and father, and loved to spend his time in the bosom of his family. He was always poor, and nearly always in debt, and even a literary pension of £200 a year, which was granted to him in 1848, and which he drew for the remaining 21 years of his life, did not help materially to mitigate his financial troubles. Cancer of the tongue was the cause of his death, which occurred at Sandford, County Dublin, on 30 Jan. 1869. He died, as he had lived, in the profession of the Protestant faith.

Carleton made some incursions into middle-class life, and even into the domains of higher society, but it is with ordinary people, and especially with the peasantry, that he is in his element and entirely at home. No one ever understood or described the Irish peasant of 75 or 100 years ago as he did. The faction fight, the party fight, the courtship, the wedding, the christening, the death-bed, the wake, the funeral, the hedge school, the secret society, the workings of landlordism, the practices of the unjust and rapacious land agent, the eviction, the revenge, the piety, superstitions, customs, peculiar expressions, modes of thought and outlook on life of the people—he brings them all before us clearly, vividly, unmistakably. Consult O'Donoghue, D. J., 'Life of Carleton' (1896).

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CARLETON COLLEGE, Minn., at Northfield was founded in 1866, and named in honor of William Carleton of Charlestown, Mass., who bequeathed for the purpose $50,000. While conducted under Congregational auspices, its instruction is undenominational. The property valued at $600,000 includes a campus and grounds of over 120 acres. The endowment is over $1,000,000. There are well-equipped chemical, physical, biological and astronomical laboratories, a conservatory of music and growing library. There is a general annual attendance of over 400 pupils, with a college faculty of 34 professors and instructors.

CARLETON PLACE, Canada, town of Lanark County, Ontario, on a navigable tributary of the Ottawa called the Mississippi River, at the foot of Mississippi Lake, and on the Canadian Pacific Railway, 28 miles southwest of Ottawa, 46 miles northwest of Brockville. It has a fine water power, large lumber and shingle mills and woolen and iron manufactories; water and sewerage systems; and is lighted by gas and electricity. The neighborhood is a favorite camping ground for summer pleasure parties. Pop. 3,621.

CARLI, kär lē, **Giovanni Rinaldo**, COUNT, Italian economist and antiquarian: b. Capo d'Istria, 11 April 1720; d. 22 Feb. 1795. He was of an ancient, noble family, and early manifested an inclination for the study of the Middle Ages, with which he connected the study of *belles-lettres* and of poetry. In his 24th year the senate of Venice made him professor of astronomy and naval science. He published his works (1784–94) in 15 volumes, under the title 'Opere del Sig. Commendatore D. Gian Rinaldo, Conte Carli, Presidente,' etc., but this edition does not include his work on the coins of Italy 'Delle Monete' (3 Vols., 1754–60); and 'Delle Antichità Italiche' (5 vols., 1788–91). His complete works appeared in 18 volumes, 1784–94.

CARLILE, John S., American lawyer and statesman: b. Winchester, Va., 16 Dec. 1817; d. Clarksburg, W. Va., 1878. After admission to the bar in 1840 he settled at Beverly, Randolph County, and began the practice of law. From 1847 to 1851 he served in the State senate. He was also a delegate to the Virginia Constitutional Convention of 1850–51, and represented his district in Congress 1855–57. At the outbreak of the Civil War, he was an avowed Unionist. He was a member of the Wheeling Convention which established the Reorganized Government of Virginia and urged quick action in the erection of a new State. He was elected to Congress in 1861 to represent the Wheeling district of the Reorganized Government of Virginia, but soon thereafter was promoted to the senate, where he served until 1865.

CARLILE, Richard, English freethinker and publisher: b. Ashburton, Devonshire, 8 Dec. 1790; d. London, 10 Feb. 1843. First apprenticed to a chemist, then to a tinman, he found employment in the latter line as a journeyman worker in London, where after reading Paine's 'Rights of Man,' he became a bold freethinker, and a publisher and purveyor of its forbidden literature. He reprinted William Horne's 'Parodies' and an imitation entitled 'The Political Litany' (1817), for which he underwent 18 weeks' imprisonment. In 1819 he was fined $7,500 and imprisoned for three years for publishing the works of Paine and other freethought writers. While in prison he conducted the publication of the first 12 volumes of *The Republican* (1819–26), for which his wife was sentenced to two years' imprisonment. Started by the Duke of Wellington, a fund of $30,000 was raised to prosecute Carlile's assistants, his property was confiscated, his sister was fined $2,500 and with nine assistants received terms of imprisonment, ranging from six months to three years. Public opinion made the government discontinue the prosecutions. On his release Carlile started *The Gorgon*, a radical weekly periodical. Before his death he was again imprisoned for terms of three years, and of 10 weeks for refusing to pay church rates. He was the boldest agitator and the greatest factor for freedom of public speech and printing of his period.

CARLIN, Thomas, American politician: b. Kentucky 1790; d. 2 Feb. 1852. He removed to Illinois in 1813, and gradually accumulated wealth, and became known and respected among the scattered population about him. He was elected governor in 1838, and retained that office for four years, during a period of unusual and violent political excitement. Illinois, having engaged largely in internal improvements, suffered severely from the commercial revulsion which was then paralyzing the whole country. She was much in debt, and had within her borders no specie, and no available means of payment. The discussion of the slavery question, too, was then furious, and had just led to the tragic death of E. P. Lovejoy. At the same time the Mormons took up their position at Nauvoo, and politicians were beginning those movements for partisan ends which seemed likely to throw the State into anarchy, and which ended ere long in the violent death of the Mormon leader. That Governor Carlin, amid such a condition of affairs, was three times re-elected to the chief magistracy affords a sure indication both of his popularity and his force of character.

CARLINE THISTLE. See THISTLE.

CARLING, SIR John, Canadian statesman: b. Middlesex County, Ontario, 1828; d. 1911. He received early education in public schools; in 1839 he removed to London, Ontario, where he joined his father in the brewing and malting business. After serving in the public capacities of school trustee and alderman, he was elected in 1857 Conservative member for London in the Canadian legislative assembly. From 1867–72 he represented London in both the House of Commons and the Ontario legislature, resigning his seat when dual representation was abolished. In 1862, he was Receiver-General; in 1867–71 Commissioner of Agriculture and Public Works; 1882–85 Postmaster-General; 1885–91 Minister of Agriculture. In 1891 elected to the senate, he resigned in 1892 but was reappointed in 1896. He received the honor of knighthood in 1893. His efforts on behalf of Canadian agriculture were of incalculable value.

CARLINVILLE, Ill., a city and county-seat of Macoupin County, 60 miles southwest of Springfield, on the Chicago & Alton and other railroads. It has a prosperous local trade and manufactures of bricks and tiles, agricultural implements, etc. There are coal-mines, oil and natural gas wells in the vicinity. It is the seat of Blackburn University, a Presbyterian institution. Its courthouse is considered one of the finest public buildings in the State. It was settled in 1833 and incorporated in 1865. Pop. 3,616.

CARLISLE, kär-līl', **Charles Arthur,** American business man: b. Chillicothe, Ohio, 3 May 1864. He received a public school education, and early in life began work on the Marietta & Cincinnati Railway as messenger boy. From 1884–86 he was connected with the *Ohio State Journal;* and in the latter year returned to railroad work in the freight department of the «Nickel Plate» road; in 1890 he was made purchasing agent of the «Burke System» of railroads; later became director of the Studebaker Brothers Manufacturing Company at South Bend, Ind., and in 1904 was elected president of the American Trust Company of South Bend. He is vice-president of the National Association of Manufacturers; is a member of the American Academy of Political and Social Science, and of the American Institute of Civics, and is prominent in charitable work and public affairs in his home city.

CARLISLE, George William Frederic Howard, English statesman and author, 7th earl: b. London, 18 April 1802; d. Castle Howard, 4 Dec. 1864. He was educated at Eton and at Christ Church, Oxford, where in 1821 he won the Chancellor's and the Newdigate prizes with a Latin and an English poem. He became earl 7 Oct. 1848, previous to which, as Lord Morpeth, he had traveled extensively in the United States. He was a long time attaché to the British embassy at Saint Petersburg. In the reformed House of Commons he represented the West Riding of Yorkshire, and under the Melbourne ministry was secretary of state for Ireland. In 1841 he was defeated in the West Riding by his Conservative opponents. In 1846, under the administration of Lord John Russell, he was appointed commissioner of woods and forests, and chancellor of the duchy of Lancaster. He was the first of the Whig noblemen of the official class to give in his adhesion to the views of the Anti-Corn Law League. In 1856 he delivered before the Mechanics' Institute at Leeds two lectures, since published, on the life and writings of Pope, and on the United States. Previous to the Crimean War, he made a tour in the east of Europe, and published his 'Diary in Turkish and Greek Waters.' On the accession of Lord Palmerston in 1855, he was nominated lord lieutenant of Ireland, which office he held till the resignation of the Palmerston ministry in 1858. His works include 'The Life and Writings of Pope' (1851); a tragedy, 'The Last of the Greeks'; and a volume of 'Poems' issued posthumously. His 'Viceregal Speeches,' edited by J. Gaskin, appeared in 1866.

CARLISLE, John Griffin, American statesman: b. Kenton County, Ky., 5 Sept. 1835; d. 31 July 1910. He received a common-school education, studied law and was admitted to the bar in 1858. He served several terms in the State legislature. During the Civil War he actively opposed secession, and in 1866 and 1869 was a member of the State senate. He was lieutenant-governor of Kentucky, 1871–75; was elected to Congress, 1876, and five times re-elected. His ability soon made him one of the Democratic leaders. In the 48th, 49th and 50th congresses he was chosen speaker. In 1890 he was elected United States senator, but resigned in March 1893, to accept the portfolio of Secretary of the Treasury in President Cleveland's Cabinet. At the close of his term he settled in New York to practise law. In 1896 he opposed Bryan and made able «sound money» speeches.

CARLISLE, England, city, capital of Cumberland County, on the river Eden, eight miles from the Solway Firth, and eight miles from the Scottish border, 300 miles by rail northwest of London. One of the oldest cities of England, important during the Roman occupation, its nearness to the border made it a prominent military station in the wars between the English and the Scotch. The Norman castle built in 1092 is well preserved and is still used as a garrison fortress. In the Civil War Carlisle sided with the King against Cromwell, and in 1745 declared for the pretender. The bishop's see dates from 1133; the cathedral, built in the Middle Ages, has no great architectural interest. The city is well supplied with municipal institutions and its chief industries are the manufacture of cotton and woolen goods, iron foundries, railway workshops, tanneries and breweries. Pop. 46,500.

CARLISLE, Pa., borough and county-seat of Cumberland County, on the Cumberland Valley and Philadelphia and Reading railroads, 18 miles west of Harrisburg. It is the farming and manufacturing trade centre of Cumberland County, and is the site of Dickinson College, founded 1783, Metzger Female College and the United States Indian Training School. It has a national bank, large manufacturing establishments, Hamilton Library, Todd Hospital, and an assessed property valuation of $3,000,000. The industries include machine shops, chain and switch works, axle factory, cotton-weaving and silk-throwster mills, body and gear works, ribbon mills, shoe factories, flour mills, hosiery, paper-box and carpet factories. Mount Holly Springs, in the mountains just outside the city, is a popular summer resort. The government is administered by a burgess elected for three years and a borough council. It was the headquarters of Washington during the Whisky Rebellion in 1794, and was bombarded by the Confederates in 1863. Pop. 10,303. Consult Wing, ‹History of Cumberland County, Pa.› (1879).

CARLISLE INDIAN SCHOOL. See UNITED STATES INDIAN TRAINING AND INDUSTRIAL SCHOOL.

CARLISTS, a Spanish political faction which advocated the claims of Carlos of Bourbon and his descendants to the Spanish throne. In 1833 the Carlists, whose chief strength lay in the Basque provinces, and who, because of their Catholic traditions and tendencies, were secretly favored by the Pope and the Eastern powers, raised the standard of revolt. They had the advantage until 1836, when Espartero inflicted on them a terrific defeat at Luchana. In August 1839 their commander, Maroto, treacherously made peace, and the remaining Carlists soon fled to France. In 1873 the grandson of the first pretender raised another revolt in the Basque provinces of Navarre and Biscay, but after several sharp conflicts the rebels were hemmed in along the north coast, and in 1876 the pretender and his chief supporters fled into France. See CARLOS DE BOURBON.

CARLONE, kär-lō'nā, the name of an Italian family of distinguished artists, who flourished in the 16th, 17th and 18th centuries. The most celebrated of them are: 1. TADDEO, a native of Rovio, who excelled in sculpture and architecture, and was employed principally in Genoa: b. 1543; d. 1613. 2. GIOVANNI ANDREA, eldest son of Taddeo: b. Genoa 1590; d. 1630 in Milan. He made great progress in painting under the tuition of Pietro Sorri in Siena, and, having afterward studied under Passignano, distinguished himself particularly by his frescoes, in which the freedom and spirit of design, the depth of expression, grandeur of conception and richness of coloring are admired. 3. GIOVANNI BATTISTA, brother of Giovanni Andrea: b. Genoa 1592; d. in Turin 1677. He was also a scholar of Passignano, and, like his brother, painted for years in Genoa, but ultimately entered the service of the Duke of Savoy. He excelled particularly in frescoes. 4. ANDREA, son of Giovanni Battista: b. 22 May 1639 in Genoa; d. there, 4 April 1697. He studied in Rome, in Venice (where he was powerfully influenced by the style of Veronese); lived for several years in Perugia and founded an academy of art there. The ancestor of this branch of the family was Giovanni Carlone, who came from Rovio to Genoa about 1570. Another branch is traced back to Scaria, near Rovio. Carlones of more or less artistic distinction are more than 50 in number, as shown in Thieme-Becker, Vol. VI, pp. 3–10.

CARLOS, Don, dŏn kär'lōs, Infant of Spain, son of Philip II and Maria of Portugal: b. Valladolid, 8 July 1545; d. 1568. He was sickly, and one of his legs was shorter than the other. The extreme indulgence with which he was educated by Joan, sister of the King, confirmed his violent, obstinate and vindictive disposition. Recent historical research has proved that he was afflicted with hereditary insanity, which an accident (occurring in 1562) involving skull fracture, emphasized. In 1560 Philip caused him to be acknowledged heir of the throne by the Estates assembled at Toledo, and in 1562 he sent him to the University of Alcala de Henares in hopes that the study of the sciences would soften his turbulent character. Contemporary historians differ in the description of the Prince. According to some he had a thirst for glory, an elevated courage, pride and a love of power. According to others he was fond of whatever was strange and uncommon; an accident or opposition irritated him to frenzy; address and submission softened him. He is also represented as a favorer of the insurgents in the Netherlands, and in particular as an enemy of the Inquisition; yet he possessed neither knowledge nor principles, nor even sufficient understanding to be capable of liberal views. With him all was passionate excitement, which resistance converted into fury. Llorente, the historian of the Inquisition, has corrected the accounts of the character and fate of this Prince from authentic sources in his work on the Spanish Inquisition (q.v.). According to him Don Carlos was arrogant, brutal, ignorant and ill-educated. So much is certain, that at the Congress of Cateau Cambrésis (1559) the marriage of Don Carlos with Elizabeth, daughter of Henry II of France, was proposed; but Philip, being left a widower by the death of Mary of England, took the place of his son. Don Carlos is said to have loved Elizabeth, and to have never forgiven his father for having deprived him of her. Llorente proves, however, that Don Carlos never had fallen in love with the Queen, and that she was never too intimate with him. In 1563 Philip, who had no other heir than Don Carlos, considering him unfit for the throne, sent for his nephews, the archdukes Rodolph and Ernestus, to secure to them the succession to his dominions. Don Carlos, who lived in continual misunderstanding with his father, resolved in 1565 to leave Spain, and was on the point of embarking when Ruy Gomez de Silva, a confidant both of Philip and Carlos, dissuaded him from his resolution. In 1567, when the rebellion in the Low Countries disquieted Philip, Don Carlos wrote to several grandees of the kingdom that he had the intention of going to Germany. He disclosed his plan to his uncle, Don Juan of Austria, who told Philip what Don Carlos had confided to him. It is believed that he was touched by the sufferings of the people of the Netherlands. Philip himself seemed to believe that his son intended to go to the Netherlands. The Infant had often shown a vehement desire to participate in the government. But Philip, jealous of his own authority, treated his son coolly and with reserve, while he gave his confidence to the Duke of Alva, to Ruy Gomez de Silva, Don Juan of Austria and Spinola. Don Carlos conceived an invincible aversion to them. The architect of the Escurial, Louis de Foix, narrates the following story relating to Don Carlos, which has been preserved to us by De Thou. The Prince had always under his pillow two naked swords, two loaded pistols, and at the side of his bed several guns, and a chest full of other firearms. He was often heard to complain that his father had deprived him of his bride. On Christmas evening he confessed to a priest that he had resolved to murder a man. The priest, therefore, refused him absolution. The prior of the monastery of Atocha artfully drew from him expressions from which it could be inferred that he meditated an attempt upon his own father. The story was then communicated to the King, who exclaimed, «I am the man whom my son intends to murder; but I shall take measures to prevent it.» Thus Philip, impelled by hatred or fear, by policy or superstition, resolved on the destruction of his only son, in whom he saw only a criminal, unworthy of the crown. On the night of 18 Jan. 1568 while Don Carlos was buried in a deep sleep, Count Lerma entered his chamber and removed his arms. Then appeared the King, preceded by Ruy Gomez de Silva, the Duke of Feria, the grand prior of the order of Saint John, brother of the Duke of Alva, and several officers of the guard and state councillors. Don Carlos still slept. They awoke him: he beheld the King, his father, and exclaimed, «I am a dead man.» Then, addressing Philip, he said, «Does your Majesty wish to kill me? I am not mad, but reduced to despair by my sufferings.» He conjured with tears those who were present to put him to death. «I am not come,» answered the King, «to put you to death, but to punish you as a father, and to bring you back to your duty.» He then commanded him to rise, deprived him of his domestics, ordered a box of papers under his bed to be seized and committed him to the care of the Duke of Feria and six noblemen, enjoining them not to permit him to write nor to speak with any one. These guards clothed Don Carlos in a mourning dress, took from his chamber the tapestry, the furniture and even his bed. Don Carlos, full of rage and despair, caused a large fire to be kindled, under pretext of the extreme cold of the winter, and threw himself suddenly into the flames. It was with difficulty that he was rescued. He attempted by turns to finish his life by thirst, by hunger, by eating to excess. After Philip had endeavored to justify his measures to the Pope and the principal sovereigns of Europe, and had also given notice to the superior clergy, the courts of justice and the cities of his empire, of what had passed, he referred the case of the Prince, not to the Inquisition, but to the council of state, under the direction of Cardinal Espinosa, who was state councillor, grand inquisitor and president of the junta of Castile. This court is said, after a minute examination and hearing many witnesses, to have condemned him to death. Other accounts, however, state that he died of a malignant fever before any judgment was passed, after having taken the sacrament with much devotion, and having asked his father's pardon, 24 July 1568. The melancholy fate of Don Carlos has served as a subject for several dramas. The romantic story may be found in works by Lord John Russell and M. J. Chénier, and in the following: C. V. de Saint-Réal, ‹Don Carlos, nouvelle historique› (Paris 1672); Schiller, ‹Don Carlos›; Alfieri, ‹Philip the Second›; de Campistron, J. G., ‹Andronic›; Otway, T., ‹Don Carlos, Prince of Spain›; Núñez de Arce, ‹Haz de Leña.› For a discussion of plays on this subject, by Ximénez de Enciso and Juan Pérez de Montlaván, consult Bacon, G. W., ‹The Life and Dramatic Works of Doctor Juan Pérez de Montlaván› (1602–38) (in *Revue Hispanique,* Vol. XXVI, pp. 1–474, 1912). For the historical account consult Ranke, in ‹Wiener Jahrbücher der Litteratur› (Vol. XLVI, Vienna 1829); Gachard, L. P., ‹Don Carlos et Philippe II› (Paris 1867); Maurenbrecher, ‹Don Carlos› (Berlin 1876); Prescott, ‹Philip II› (Boston 1855); Hume, ‹Spain: Its Greatness and Decay, 1479–1788› (Cambridge, 1st ed., 1898; 2d ed., 1899, reprinted 1905); Hume, ‹The Spanish People› (London 1901).

CARLOS I, King of Portugal 19 Oct. 1889–1 Feb. 1908: b. 28 Sept. 1863; assassinated Lisbon, 1 Feb. 1908. He was son of King Luiz I and Queen Maria Pia who was the daughter of King Victor Emmanuel II of Italy; and was a descendant of King John IV, sometimes called «The Restorer»—that Dom João, Duke of Bragança, who was proclaimed king when the revolution of 1640 wrested (with English aid) Portugal from Spain. In 1905, when Carlos visited King Edward VII, the historic friendship of Portugal and England was strengthened. Carlos married Princess Marie Amelia, daughter of Philippe d'Orleans, Comte de Paris. Prince Louis Philippe, heir apparent, born 1887, was assassinated with his father, and Prince Manuel, born in 1889, was proclaimed King Manuel II 2 Feb. 1908, and exiled 5 Oct. 1910.

CARLOS DE BOURBON, Don Maria Isidor, second son of Charles IV of Spain and brother of Ferdinand VII: b. 29 March 1788; d. Trieste, 10 March 1855. In 1808 he was compelled by Napoleon along with his brother, who had now succeeded to the throne, to renounce all claims to the succession, and was detained with Ferdinand in captivity at Valençay in France till 1814. In 1816 he married Maria Francisca d'Assis, daughter of John VI of Portugal, his brother, the King of Spain, having at the same time espoused another daughter of John as his second wife. This last marriage, like Ferdinand's first, having turned out unproductive of issue, a prospect opened to Don Carlos of succeeding to the crown, which almost assumed the shape of absolute certainty when a third marriage contracted by Ferdinand proved equally unsuccessful with the two former in producing an heir to the Spanish monarchy. On the death of Ferdinand's third wife in 1829 he again married, and, by a pragmatic sanction, the contingency of a female heir was provided for by the repeal of the Salic law, which excluded such from the throne. On 10 Oct. 1830, Maria Isabella, afterward Queen of Spain, was born. In 1832 Don Carlos' party succeeded by taking advantage of the King's imbecile condition in obtaining a repeal of the pragmatic sanction; but this advantage was temporary, as Ferdinand disowned his act on recovering the use of his reason. The following year Don Carlos was exiled with his wife to Portugal; and having refused to return to be present at the taking of the oath of allegiance to the young Queen, he was commanded by Ferdinand to retire to the Papal States. On 29 Sept. 1833 Ferdinand VII died, and a few days afterward his consort, the Queen-regent, repeated the order to his brother to quit the country. The latter, however, now announced himself as legitimate King of Spain, and was recognized as such by a considerable party who excited a civil war in his favor, and thenceforward were designated by the title of Carlists. After a course of hostilities extending over several years with varying success, he found himself obliged in 1839 to take shelter in

France. In the meantime he and his descendants had been formally excluded from the succession by a vote of the Cortes in 1836. On arriving in France the castle of Bourges was assigned him as a residence, and he was also detained a prisoner there for a considerable time owing to his refusal to make the renunciations demanded of him. In 1845 he resigned his claims in favor of his eldest son, and in 1847 was permitted to take up his abode in Trieste, where he died. Consult Baumgarten, 'Geschichte Spaniens' (Leipzig 1861); Butler-Clarke, 'Modern Spain' (Cambridge 1906) with a useful bibliography; Hume, 'Modern Spain' (London 1906), an account by one whose family took a considerable part in the events of the first half of the book, and who himself witnessed much of what is related in the last half.

CARLOTA, kär-lō'ta, Philippines, (1) a town of Negros Occidental, situated in the western part of the island of Negros, 20 miles south of Bacolod. Pop. 13,097. (2) A town in the eastern part of the island of Negros (Negros Oriental). Pop. 6,386.

CARLOTTA (Marie Carlotta Amélie), Empress of Mexico: b. near Brussels, 7 June 1840. She was the daughter of Leopold I, King of Belgium, and married Maximilian, Archduke of Austria, 27 July 1857. In 1863 she went with her husband to Mexico and remained there till 1866, when the dissatisfaction against the empire forced her husband to send her from the land of their adoption to ask help in France. She could obtain no assistance from Napoleon III and went to Rome to appeal to the Pope. Before negotiations there were completed, her health gave way under the strain, and after the end of the empire and the execution of her husband (19 June 1867) she became totally insane. She was taken at first to the Château of Laeken, and afterward to the Château de Bouchoute, near Brussels, Belgium, where she was still living in seclusion at the time of the invasion of her native land and the beginning of the war in Europe.

CARLOVINGIANS, or **CAROLINGIANS,** the second dynasty of the French or Frankish Kings, which supplanted the Merovingians, deriving the name from Charles Martel or his grandson Charlemagne (that is, Karl or Charles the Great). Its origin is usually traced to Saint Arnulf, bishop of Metz (d. 641), whose grandson, Pepin of Heristal, held the office of mayor of the palace in Burgundy, Neustria and Austrasia. This Pepin of Heristal, who died in 714, left as his successor a young grandson; but the actual inheritor of his ability was Charles Martel, a natural son. Charles Martel became mayor of the palace in 714 to the Merovingian *roi fainéant* Childeric, and in this office was succeeded by his son Pepin le Bref, who in 751 deposed the merely nominal King and himself assumed that title. He was succeeded by Charlemagne and his brother Carloman (768–71). Charlemagne became sole king in 771, and extended greatly the dominions of the family. In 800 Leo III crowned him Emperor of the West. On his death in 814 he was succeeded by his son Louis the Pious, who divided his empire among his sons, and at his death, in 840, his son Charles the Bald became King of Neustria, the Spanish Mark and Aquitania, and is therefore regarded as the founder of the French dynasty. He died in 877, and was succeeded by a number of feeble princes. The dynasty came to an end with Louis V who died in 987. The house of Capet followed it, and the Capets also traced their descent from Charlemagne, but only because they were connected by marriage with the Carlovingians.

CARLOVITZ, or **CARLOWITZ.** See Karlowitz.

CARLOW, Ireland, an inland county in the province of Leinster, surrounded by Kildare, Wicklow, Wexford, Kilkenny and Queen's County. It is generally level or undulating except in the southeastern parts. The chief rivers are the Slaney and Barrow. From the remarkable fertility of its soil it is almost entirely an agricultural county, producing a great deal of butter, corn, flour and other agricultural produce for exportation. Agriculture is here carried on with as much skill and knowledge of recent improvements as anywhere in Ireland, and there is less poverty than in most parts. There is abundant limestone, and granite is quarried. Area 346 square miles. Pop. (1911) 36,252, of which 89.2 per cent are Roman Catholics.

CARLOW, Ireland, the capital of the county of Carlow, on the Barrow, 56 miles southwest of Dublin by rail, with which it is also connected by canal. It has two principal streets intersecting at right angles. A bridge of five arches leads over the Barrow to the suburban village of Graigue, in Queen's County. The principal public buildings are the Roman Catholic cathedral and college and the Protestant parish church. It is lighted by electricity, and has an excellent water supply. Carlow is the principal mart for the agricultural produce of the surrounding country, has brewing and corn milling industries, and anthracite coal is worked. On rising ground to the south stand the ruins of the ancient castle of Carlow, still presenting a very imposing appearance. In the Rebellion of 1798 Carlow was unsuccessfully attacked by the insurgent forces. Pop. (1911) 6,619.

CARLSBAD, kärls'bät, Bohemia, a town on the Tepl, near its influx into the Eger, 116 miles west by north of Prague by rail. It is widely celebrated for its hot mineral springs, and is perhaps the most aristocratic of the watering places of Europe. In the season, April to October, the visitors may number from 50,000 to 60,000. Set in most lovely scenery 1,165 feet above sea-level, the town is well built and offers good accommodation for its guests. The temperature of the hot springs varies from 47° to 165° F. The principal spring, the Sprudel, has a very large volume, and is forced up to a height of three feet from the ground. Altogether, the daily flow of the springs of Carlsbad is estimated at 2,000,000 gallons. Somewhere approaching 2,000,000 bottles of water are exported annually. The principal ingredient in the water is sulphate of soda. The whole town of Carlsbad appears to stand on a vast caldron of boiling water, which is kept from bursting only by the safety-valves the springs provide. Ascribing its foundation to the Emperor Charles IV (1347), Carlsbad was made a free town by Joseph I. Here were formulated in 1819 the reactionary Carlsbad Decrees (q.v.). Pop. 17,446.

CARLSBAD, Congress of, a conference of ministers representing Austria, Prussia and many small German states, which met at Carlsbad in August 1819 to concert measures to arrest the democratic tendencies then manifesting themselves in Germany. Its members recommended to their governments and to the German Diet the famous ‘Carlsbad Decrees,’ which were adopted by the Diet, 20 Sept. 1819. Among the most important of the decrees were those recommending severe press censorship, the establishment at Mainz of a central commission for the investigation of political intrigues, the suppression of the secret student organization, the Burschenschaft, and government inspection of the universities.

CARLSBAD DECREES, the resolutions adopted in the summer of 1819 at the conference of the German ministers at Carlsbad, for the suppression of the so-called Demagogic Movement. The fear of a far-spreading conspiracy against the German princes, which had been excited by the murder of Kotzebue by Karl Sand, was skillfully employed by Metternich as an excuse for combining the German governments for the extermination of Liberalism. The representatives of Austria, Prussia, Bavaria, Saxony, Hanover, Würtemberg, Baden, Mecklenburg, Nassau and Saxe-Weimar participated in the meeting. It was decided, that the censorship of the press should be rendered more strict, that the universities should be forbidden to spread liberal doctrines, that secret societies should be suppressed, and that a commission to sit at Mainz should be appointed to extirpate the revolutionary conspiracy which was supposed to exist. An attempt to determine more precisely the nature of the constitution permissible for the states of the German Confederation led to a stalemate between the conservative Austrians and the Würtembergers who already had a liberal constitution. This was only solved at the conference of Vienna the following year. (See Metternich). Consult de Martius, ‘Nouveau recueil général des traités’ (Göttingen 1846).

CARLSBURG, kärls'boorg, or **KARLSBURG,** Austro-Hungary, a royal free city (ancient Apulum) on the right bank of the Maros, 48 miles south of Klausenburg. It consists of an upper and a lower town, situated on opposite sides of the river, and communicating by a long bridge. It is defended by a citadel, and has a cathedral (dating from 1443) with a number of ancient monuments, a mint where the gold and silver obtained in Transylvania are purified and coined, an observatory with a good collection of instruments, an excellent library, a theological college, a gymnasium, arsenal and barracks. Pop. about 12,000.

CARLSCRONA, kärls'krō-na, or **KARLSKRONA** (“Charles' Crown”), Sweden, a seaport at the southern extremity of the peninsula, on the Baltic, capital of the län or province of Blekinge or Carlscrona, 55 miles east by north of Christiansand. It stands on several rocky islets connected with one another and with the mainland by bridges, has broad, clean but somewhat steep streets, with houses mostly built of wood. The harbor is safe and spacious and the entrance is protected by forts. It was founded by Charles XII in 1680. As the chief Swedish naval station the town largely depends on the trade thereby occasioned, but it has also a considerable export trade in timber, tar, potash, fish, etc. Pop. 27,434.

CARLSEN, Emil, American artist: b. Copenhagen, Denmark, 19 Oct. 1853. He came to the United States in 1872 and studied art in Boston. Since 1891 he has lived in New York and has exhibited frequently there. His especial field is still life painting, but he is also favorably known as a landscape artist. His landscapes are sincere and direct in presentation, and his marines are particularly good in the movement of the water. He excels especially in line and in arrangement. Among his best known works are ‘Sooty Kettle’; ‘A Connecticut Hilltop’; ‘The Rising Storm’; ‘Night — Old Wyndham’ (1905, Webb prize, Society of American Artists); ‘Wind in the East’; ‘A Lazy Sea’; ‘A Stormy Afternoon’ (1909); ‘The Sky and the Ocean’ (1914). He is represented in the Metropolitan Museum, New York, by a still life and two marines, of which ‘Surf Breaking’ is especially fine; also in the Brooklyn Institute Museum and the Worcester Museum. He received a gold medal at the Saint Louis Exposition in 1904, and is a member of the National Academy of Design and of the National Institute of Arts and Letters.

CARLSHAMN, kärls'häm (“Charles' Haven”), Sweden, a seaport town 27 miles west of Carlscrona, in a beautiful valley at the mouth of the Mie-A. It is regularly built, and its square market-place, planted on all sides with trees, has a fine appearance. It has an elegant townhouse, a good harbor and an active trade. Timber and articles of timber, granite, charcoal and fish constitute the chief exports. The manufactures are sail-cloth, sacking, tobacco, leather, etc.; and there is also some ship-building. It was founded in 1664. Pop. about 7,000.

CARLSON, Anton Julius, American physiologist: b. Bohuslan, Sweden, 1875. In 1891 he came to the United States, and after studying at Augustana College, Ill., and Leland Stanford University, he became instructor and assistant professor in physiology in 1904 at Woods Hole laboratory. In 1909 he received the appointment of professor of physiology at the University of Chicago. He is the author of ‘Physiology of the Nervous System of the Snake and the California Hagfish’ (1904) and of numerous articles in physiological journals on saliva and saliva secretion, on the thyroids, parathyroids and pancreas, lymph and lymph formation, heart and circulation.

CARLSON, Fredrik Ferdinand, Swedish historian: b. Upland, 13 June 1811; d. Stockholm, 18 March 1887. After leaving the University of Upsala, he became tutor to the royal family at Stockholm (1837–46). He returned to the university as professor of history (1849) and became rector (1860). He represented the university in the National Diet; later he sat for the Swedish Academy of Sciences (1858); and represented Gefleborg in the first chamber from 1873. He was appointed head of the Department of Public Worship, which post he held from 1863–70 and again from 1875–80. He was prominent in public matters for many years, being Minister of Ecclesiastical Affairs, 1863–70 and again, 1875–78. He completed Geijer's 'History of Sweden' (7 vols., Stockholm 1855–85).

CARLSRUHE, kärls'roo-ü, or **KARLSRUHE** ("Charles' Rest"), Germany, the capital of the grand duchy of Baden, 39 miles north-northwest of Stuttgart. It was laid out in 1715, and is one of the most regularly built towns in Europe. The castle of the Grand Duke stands in the centre of the city, and from this point a number of streets radiate fan fashion, at regular distances from each other. Other streets intersect these in parallel circles. The roads leading to the city correspond to this regular disposition, which, as is apt to be the case in strictly regular cities, often leaves upon the traveler the impression of monotony rather than that of agreeable order. The city is ornamented with several beautiful public buildings, including the palace, in front of which is a bronze statue of the founder of the city, the Margrave Charles William, the Parliament house, town-hall, etc. The court library contains 150,000 volumes; there are also here several valuable museums and cabinets, a botanic garden, several institutions for the promotion of literature and the fine arts. The city has a largely developing trade in engines, carriage works, furniture, paper and plated goods. Pop. (1911) 134,313.

CARLSTAD, kärl-stät, Sweden, town and the capital of the län of Vermland, on an island in Lake Wener formed by the two mouths of the Klar, and connected with the mainland by a bridge across either stream. It is beautifully situated, regularly built, is the seat of a bishop, and has a cathedral, gymnasium, townhouse, etc., and some trade in copper, timber, iron, machinery, tobacco, matches and grain, and also exports wooden ware and iron. The city was founded in 1584 and rebuilt after the fire of 1865. A conference between Sweden and Norway was held here in 1905 to decide on the discontinuance of the union between these countries. Pop. 17,000.

CARLSTADT, Andreas Rudolf Bodenstein, German theologian: b. Carlstadt, Franconia, 1480; d. Basel, Switzerland, 25 Dec. 1541. He is celebrated in the history of the Reformation for his fanaticism as well as his misfortunes. He studied at Erfurt (1500–03), Cologne (1503) and Wittenberg (1510), where he was finally appointed professor of theology in 1513. In 1515 he went to Rome to study law and took the degree of LL.D. His learning enabled him to render great support to Luther in his first steps for the introduction of a reformation. In 1520 he was included in the bull which condemned Luther; and his spirited appeal from the Pope to a general council, of which he gave the first example, as well as his opinion openly expressed, in favor of the marriage of the priesthood, was among the many proofs which he gave of his zeal for the Reformation. While Luther was at Wartburg Carlstadt's zeal urged him to acts of violence. He even instigated the people and students to the destruction of the altars and the images of the saints, greatly to the displeasure of Luther, who lost the friendship of Carlstadt by his opposition to his excesses. He publicly declared himself the opponent of Luther, and the Elector Frederick banished him from the country in September 1524. Carlstadt then commenced the controversy respecting the sacrament, denying, in opposition to Luther, the bodily presence of Christ in the sacramental elements, and recognizing in the rite a token of remembrance simply. This controversy was carried on with the bitterest animosity; and Zwinglius having declared himself in favor of Carlstadt's doctrine, a dispute ensued between the Swiss and Wittenberg theologians which ended in the separation of the Calvinists and Lutherans. Carlstadt in the meantime being suspected, not without reason, of having taken part in the revolt of the peasants in Franconia, was obliged to wander through Germany, and being ultimately reduced to extreme distress, sought relief of Luther who procured him an asylum at Kemberg, on condition that he should refrain from the expression of his opinions. Here he lived nearly three years. His restless mind, however, soon led him to break his promise, by the publication of some writings in 1528; and he even went so far as to plot against Luther's person. To escape from the consequences of his conduct he repaired to Switzerland at the end of the same year, where he was appointed vicar of Altstadt, in the valley of the Rhine; in 1530, deacon at Zürich; and in 1534, vicar and professor of theology at Basel. Consult, for his biography, Jäger, J. C. (Stuttgart 1856) and Lindsay, 'History of the Reformation' (Vol. I, New York 1906). Many of his letters are in Olearius, 'Serinium Antiquarium' (Halle 1698).

CARLSTADT, Austria, a town in Croatia, 34 miles southwest of Agram, agreeably situated in a perfectly level and richly cultivated plain near the junction of the Kulpa, Korana and Dobra, which are here navigable. It consists of the town proper and the citadel, together with the suburb of Dubovacz. It is the seat of a Greek bishopric, is tolerably well built and has an important trade. It also has a higher gymnasium and military school and has a distillery and a turbine rolling mill. Pop. 16,000.

CARLSTADT, N. J., borough of Bergen County, 10 miles north of Jersey City, on the Erie Railroad. It has brass, onyx and marble works, silk mills, cotton cloth mills, sable cloth works and air valve manufactories. It is governed by a mayor and council, the former being chosen for a period of two years. Pop. 3,807.

CARLYLE, kär-līl', **Alexander,** Scottish clergyman: b. Prestonpans, 26 Jan. 1722; d. Inveresk, 28 Aug. 1805. He was educated at the universities of Edinburgh and Glasgow, and afterward studied at the University of Leyden. Licensed as a preacher in 1747 he became minister of the parish of Inveresk, in Midlothian, where he continued to the end of his life. He was one of the leaders of the Moderate party in the Scottish Church, the party which, during the latter half of the 18th century, ruled with such predominating sway, and included the names of Robertson, Blair and Home among its members. As an eloquent debater and skilful ecclesiastical leader in the General Assembly he had no rival. He was of such striking personal appearance that he was called "Jupiter

Carlyle.» He strenuously resisted all attempts to give additional influence to the popular element in ecclesiastical matters. He left behind him a well-known autobiography, which, though commenced in his 79th year, is a singularly interesting production, both from the vigor and sprightliness of its style, and the pictures which it presents of Scottish society in the 18th century, and the more or less intimate account it gives of such noted characters as Home, the dramatist, Adam Smith and David Hume. After remaining long in manuscript it was published in 1860, under the editorship of John Hill Burton.

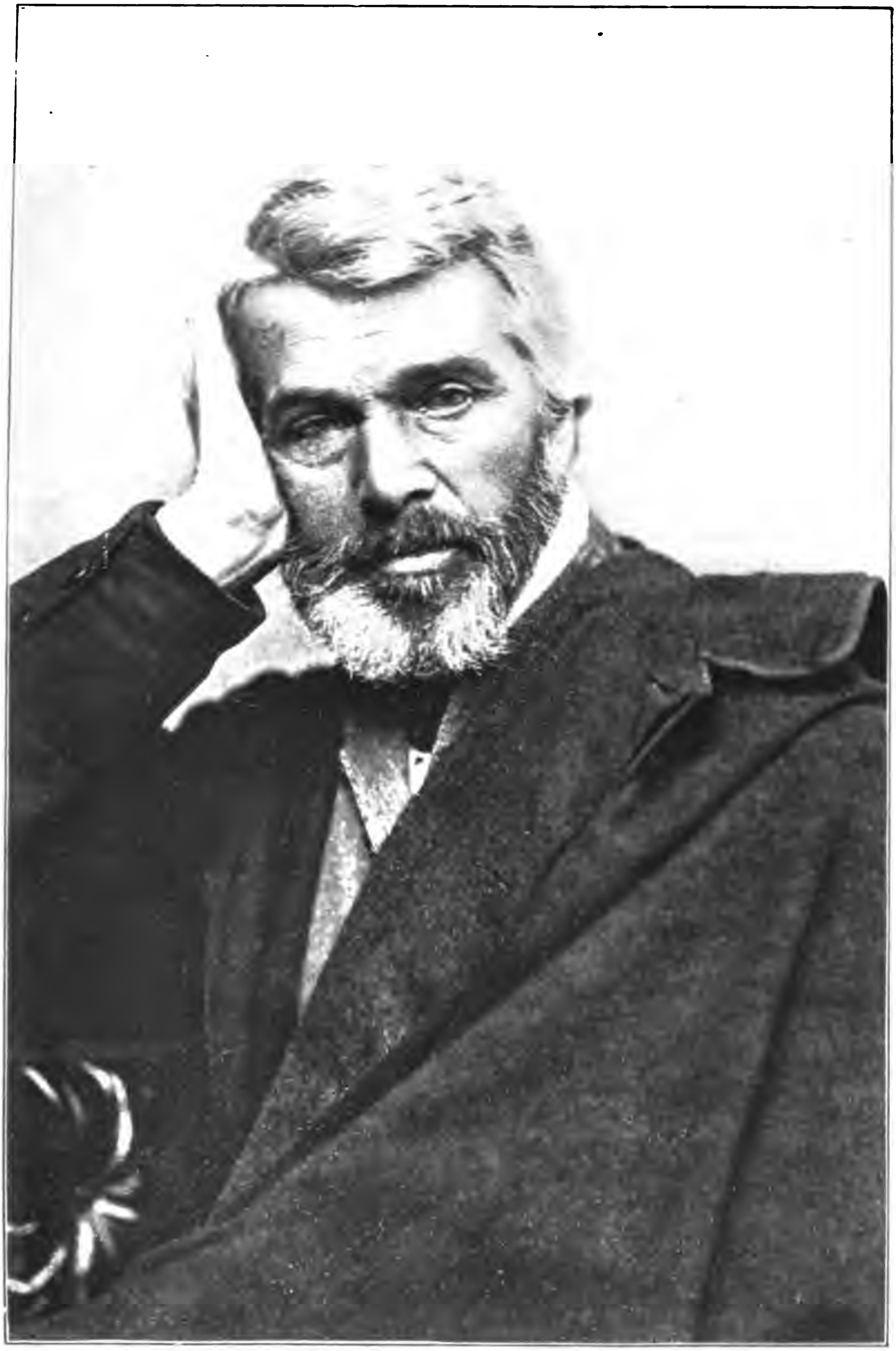
CARLYLE, Jane Baillie Welsh, Scottish letter writer: b. Haddington, Scotland, 14 July 1801; d. London, 21 April 1866. She was the daughter of John Welsh, a Haddington surgeon, and was married to Thomas Carlyle (q.v.) 17 Oct. 1826. Her letters, edited by her husband, were published in 1883. Consult Ireland, 'Life' (London 1891); and 'New Letters and Memorials' (London 1903).

CARLYLE, John Aitken, English physician, brother of Thomas Carlyle: b. Ecclefechan, Dumfriesshire, 7 July 1801; d. Dumfries, 15 Dec. 1879. He studied at Edinburgh where he took his degree of M.D. in 1825, and later completed his education in Germany. He practised for a short time at London, where he was unsuccessful. He attempted literature for a while, assisting his brother in translating Legendre's 'Geometry.' He then received an appointment as traveling physician to Lady Clare (1831–37), and later to the duke of Buccleuch (1838–43). Retiring to a place near the Chelsea residence of his brother, he devoted himself to literary labors and in 1849 published a translation of Dante's 'Inferno,' a very scholarly and finished work. A very friendly relation existed between the brothers, as evinced by letters and the will of Thomas. Dr. Carlyle edited also Irving's 'History of Scottish Poetry' (1861).

CARLYLE, Joseph Dacre, English Orientalist: b. Carlisle 1759; d. Newcastle-upon-Tyne, 12 April 1804. He was graduated from Cambridge, became chancellor of Carlisle in 1793, professor of Arabic at Cambridge in 1795 and was subsequently appointed to the Turkish embassy. He published 'Specimens of Arabic Poetry' (1796); 'Poems' (1805), and a translation of an Arabic history of Egypt. His Arabic Bible was published in 1811, completed and edited by H. Ford, professor of Arabic at Oxford.

CARLYLE, Thomas, Scotch essayist, historian and miscellaneous writer: b. Ecclefechan, near Annandale, in Dumfriesshire, Scotland, 4 Dec. 1795; d. London, 4 Feb. 1881. Carlyle's ancestors were said to have come to Annandale from Carlisle, England, in the time of David II, but at the author's birth the immediate family was living in very straitened circumstances at Ecclefechan, where the grandfather, Thomas, was village carpenter and his five sons masons. The second of these, James, a man of «largest natural adornment,» assertive, choleric, honest and pious, with an uncommon gift of forcible expression, married as his second wife Margaret Aitken, a woman of affectionate nature and piety of mind. By her he had four sons and five daughters, of whom the eldest was Thomas. The third son, John Carlyle (q.v.), became distinguished as the translator of Dante. Thomas, like the other children, was brought up with much affectionate care. His parents intended him for the Church and gave him all the education in their power. He early learned his letters and soon became a voracious reader. At 10 he was sent to the grammar school at Annan, where, as a moody, sensitive child, he was much bullied by the other boys, and probably suffered acutely. At the age of 13 he was ready to enter Edinburgh University, which he attended from 1809 to 1814, without, however, taking a degree. His individuality did not readily allow itself to be molded to the academic routine. Finding himself unable, because of religious doubts, to enter the ministry, he went to Annan Academy as tutor in mathematics, in 1814. Later he taught at Kirkcaldy, where he made the acquaintance of Edward Irving (q.v). one of his warmest friends. Irving's friendship was of great value to Carlyle, and his library enabled the latter to gratify his love of reading and to mitigate the distaste which he felt for teaching. In October 1818 the work became so repellent that he resigned from his school, saying that «it were better to perish than to continue school-mastering.» Then he went to Edinburgh to try to earn his living.

The next three years were perhaps the most trying of his life. He was tormented to an uncommon degree by his lifelong enemy, dyspepsia, and as a result was greatly depressed in spirit. Uncertain what career to follow, trying his hand at many vocations and different studies, miserably poor, finding his only employment for a time in writing hack articles, he was «mentally and physically adrift» in the sense that is described in his «Everlasting No» of 'Sartor Resartus.' Toward the middle of 1821, however, he seems, by much resolution and energy of will, to have shaken off much of the depression, to have attained the position of the «Everlasting Yea.» The men who at this time most influenced him were the Germans, particularly Goethe, the mystic Richter, and the philosopher Fichte. German literature was now his most absorbing study, and later this study bore fruit in his 'Life of Schiller' (1823–24), his translation of Goethe's 'Wilhelm Meister' (1824) and in several essays. These books mark his formal entrance into literature. Up to the time of their publication Carlyle's published writing had been a series of articles for Sir David Brewster's 'Encyclopedia,' a translation of Legendre's 'Geometry,' to which he prefixed an 'Essay on Proportion,' and miscellaneous hack work. The 'Life of Schiller' and the translation of 'Wilhelm Meister' met with favorable reviews, and the translation is usually regarded as one of the best of all renderings into English. While he was at work on these books he was (1822–24) tutor in a well-to-do family, the Bullers, from whom he received £200 a year for not disagreeable work. In spite of the kindness of his patrons, he managed, as was usual with him during life, to find much fault with his surroundings and to utter complaints with very little fairness or reserve. A trip (1824) to London and Paris broke the monotony of his existence, and gave him many new impressions and opinions in what was a critical period of his growth.



THOMAS CARLYLE

Returning to Scotland in 1825 he established himself at Hoddam Hill, a farm near the Solway, where he farmed and wrote. On 17 Oct. 1826, Carlyle, after a somewhat prolonged, vacillating and rather stormy wooing, succeeded in marrying Jane Baillie Welsh, a woman in many ways as remarkable as himself and distinguished as a descendant of John Knox. The humors and distempers of their married life have become proverbial and are to be found most fully recorded in Froude's biography. Both seem to have been extremely and unintelligently self-willed and so vain as to be wholly lacking in reticence about their domestic life. For two years they lived at Scotsbrig near Edinburgh, where they had the advantage of the intelligent society of the capital, and where Carlyle supported himself by writing for the reviews. In the *Edinburgh Review,* under the editorship of his friend Jeffrey (q.v.), he published, in 1827, his well-known essay on ‘Richter’ and ‘The State of German Literature,’ an article which led to the famous correspondence with Goethe. For several years the *Edinburgh* and other reviews were his only medium of publication. He essayed a novel but failed, and was disappointed in his attempts to secure the chair in moral philosophy at Saint Andrews and a professorship in London University.

In May 1828 the Carlyles removed to a lonely farm, Craigenputtoch, overlooking the Solway. Here he wrote his ‘Essay on Burns,’ one of his most sympathetic pieces of criticism (*Edinburgh Review,* 1828), several other essays of much importance, as ‘Voltaire,’ ‘Novalis’ and his ‘Sartor Resartus,’ the book for which he is perhaps most famous. Refused by several publishers, ‘Sartor Resartus’ first saw light in *Fraser's Magazine,* between December 1833 and August 1834, where it excited such a storm of protest that no separate English edition appeared till 1838. Meanwhile (1836) it first appeared in book form in America, where it was especially commended by Emerson. This most characteristic book of Carlyle purports to be a review by an English editor of a treatise by a learned German professor, Herr Teufelsdröckh, with whose life and opinions it deals. The book is written around the famous Philosophy of Clothes, designed by Swift (q.v.), and is in the main symbolical of Carlyle's creed at this time — that as clothes express the taste of the wearer, so life in all its forms may be regarded as the vesture of the mind. The idea is not a very original one, but is expressed with such oddity of phrase and image that it appears as profound as forcible. The most interesting feature is the account of the moral and spiritual attire of Teufelsdröckh, who is Carlyle himself. It is the querulous, stormy tale of early suffering, lack of sympathy from fellowmen, disappointment alike in the business of the head and the affairs of the heart, despondency and despair over the great question why man is in the universe, doubt and wavering, and final acceptance of the facts of existence with the hope of solution through stern endeavor. The book might be called a prose epic of the inner life, and it is wholly egoistic and anthropocentric.

In 1834 the Carlyles removed to London, where they settled in Cheyne Row, Chelsea, and here were their headquarters for the remainder of their lives. Soon after the change he began his ‘French Revolution,’ which was completed in 1837 and which gave him much more reputation than he had heretofore enjoyed. During the same period he wrote the ‘Diamond Necklace’ and the articles on ‘Mirabeau’ and ‘Sir Walter Scott,’ the honorarium from which was of great benefit in his impecunious state. The success of the history enabled him, in the four following years, to gain audience for four series of lectures, ‘German Literature,’ the ‘History of European Literature,’ ‘Revolutions’ and the more characteristic ‘Heroes and Hero-Worship.’ Published in book form in 1841, this series remains to-day one of the most widely read of Carlyle's works and is perhaps the clearest expression of his philosophy of history. "As I take it," he says, "universal history, the history of what man has accomplished in this world, is at bottom the history of the great men who have worked there." The moral animus of the book is expressed farther on in the same introduction: "We cannot look, however imperfectly, upon a great man, without gaining something by him. He is the living light-fountain which it is good and pleasant to be near." Again, speaking of the Hero as a man of letters, he tells us the purpose of all his own writing: "The writer of a book, is he not a preacher, preaching not to this parish or that, on this day or that, but to all men in all times and places?"

The book may conveniently mark an important time in Carlyle's life. The pamphlet on ‘Chartism’ of 1840 had enunciated a doctrine, of a political sort, that "Might is right," —"one of the few strings," says Nichol, "on which, with all the variations of a political Paganini, he played through life." About this time, in short, his ideas of history, of morals, of politics, of his own mission, seem to have crystallized. Furthermore, his circumstances had definitively bettered. His name was well known and he was able to refuse a chair of history at Edinburgh University and later another at Saint Andrews. In 1842 the death of Mrs. Carlyle's mother threw an income of at least £200 in the hands of the Carlyles and relieved them of the fear of penury.

From this time on Carlyle's work falls mainly into two main classes: (1) the lives of great individuals and (2) pamphlets of a quasi-political sort, powerful lashings of modern institutions. The most important of the latter, ‘Past and Present,’ written in seven weeks, appeared in 1843. Herein Carlyle commits a common and characteristic fallacy in comparing a charming picture of monastic England with some of the worst things of modern life, to the obvious disadvantage of the latter and, by extension and implication, to modern civilization as a whole. Nevertheless, the book makes a strong appeal to our humanity, and is perhaps the best example of Carlyle's many protests against modern barbarism. It is said to have been productive of good in factory legislation. Meanwhile he was engaged on an important work of the first class spoken of,— ‘Cromwell,’ which, after three years' preparation, appeared in 1845. Carlyle, with characteristic thoroughness, spent a large part of the summers of 1842 and 1843 in visiting the battlefields of the Civil War. It is significant that the "great man" was now, with Carlyle, not necessarily a man of letters, as in his works previous to the 'French Revolution,' but a man of political prowess as well, and this tendency to exalt the man of might reached its climax in the 'History of Frederick II.' The years between 'Cromwell' and the beginning of 'Frederick' are marked by his notable 'Latter-Day Pamphlets' (1849), one of the most denunciatory of his books, and his 'Life of John Stirling' (1851), a dear friend who had died six years before and who, like Edward King and Arthur Hallam, is chiefly remembered through the work of a greater man. After a trip in the fall of 1851, with the Brownings, to France, where he met the chief literary celebrities of the time — and passed unfavorable comment on them as on all affairs French — he settled down to the planning of the 'History of Frederick II.' On the preparation of this work and the composition of it he was engaged for the next 13 years. His study was indefatigable and he made two trips to Germany, in 1852 and 1858, to study the battlefields of Frederick. In 1850 the first two volumes were published with great success, the third in 1862, the fourth in 1864 and the fifth and sixth in 1865. During the composition he had done practically no side work; a somewhat unintelligent dialogue, 'Ilias Americana in Nuce,' on the American War, and his 'Prinzenraub' are the only pieces.

The compilation of 'Frederick' marks the climax of Carlyle's life. It won for him recognition in England as the foremost of prose writers, and in Germany, too, his fame was naturally great. Even the Scotch decided to honor a prophet of their own country; he was elected lord rector of Edinburgh University, and in the spring of 1866 delivered the inaugural address, on the 'Reading of Books.' While on his trip he received news of the death of Mrs. Carlyle, which, in spite of their disagreements, was a severe blow to him and may be said to mark the beginning of his decline. He was over 70 years of age and the labor of 'Frederick' had left him worn and weary. Thereafter he wrote only three books of comparative importance. 'Shooting Niagara — and After,' of the type of 'Past and Present,' the 'Early Kings of Norway,' of the hero type, and 'Reminiscences of Jane Carlyle and of Jeffrey and Edward Irving,' written in the months following the death of his wife, but not published until after his death. His last public utterance, according to Froude, was a letter which he wrote, in May 1877, to the *Times*, protesting against the moral support which England was giving to Turkey in the war with Russia. His life at this time is described as one surrounded by honors and supported by a few staunch friends, but as one of growing weariness and desire to be at rest, until, after two years of physical feebleness, he died quietly in his 86th year.

Carlyle's character and place in literature have, since his death, as during his life, been subjects of much comment and of comment of the most diverse sorts. He has been extolled on the one hand as the greatest of prophets, the most eloquent of sages; and condemned, on the other, as the noisiest of egoists. It is therefore impossible to fix with any approximation his value as a character or as a man of letters, in the sense that Milton, Addison, Gray and others may be tolerably well characterized. His severest critics, like Mr. Robertson, are undoubtedly right when they accuse him of inconsistency and irrationality and when they point out in his character certain elements of brutality and narrow egoism, and yet the fact remains that he has been the awakening force of many men and that there is a feeling abroad that he is one of the great names in English prose. Perhaps the most sensible of these opposing views may best be summed up in Huxley's words (letter to Lord Stanley, 9 March 1881): "Few men can have dissented more strongly from his way of looking at things than I; but I should not yield to the most devoted of his followers in gratitude for the bracing, wholesome influence of his writings when, as a very young man, I was essaying without rudder or compass to strike out a course for myself."

In view of such diverse opinions, all of which contain truth, it seems necessary merely to protest against those extremist views which have just been referred to. Whether one regards him as the wisest of men or the noisiest of hypocrites is, after all, a question of temper or of what one regards as valuable in the universe, and usually has value only as the expression of personal opinion. Carlyle's influence, like that of Dr. Johnson, is the personal influence of a powerful and upright man rather than that of a philosopher or a discoverer of new truth. His personal qualities as expressed in his writings — his integrity, his earnestness, his independence, his sincerity, his hatred of sham, cant and affectation, his vigor — are what count in his hold on people. As a system, his work, as his critics justly remark, is unscientific and untrue. His work, so voluminous and, on the face of it, consisting of translations, literary, biographical, historical essays and books, tracts of the times and satires, comes down to the glorification of a galaxy of interesting and, in different ways, powerful individuals: Schiller, Goethe, Cromwell, Frederick, himself (in 'Sartor Resartus') and others, and to the doctrine that their power is good. There is, of course, no means of testing the general truth of such views. They are really personal. He is, therefore, to be regarded as a seer, a prophet, a preacher, who feels deeply a, rather than *the*, meaning of life, and exhorts his readers to feel rightly and live rightly, to "do the duty which lies next them," to "work and despair not." These things he said with an impressiveness equaled by few men and to a very large body of listeners. See FRENCH REVOLUTION, THE; HERO AND HERO WORSHIP; SARTOR RESARTUS; FREDERICK THE GREAT.

Bibliography.— Of the numerous editions of Carlyle's writings the best, aside from his correspondence, is probably the Ashburton Edition, in 17 volumes. The 'Early Letters of Thomas Carlyle' (1886; 2d series, 1888); the 'Correspondence between Goethe and Thomas Carlyle' (1887); and the 'Correspondence of Thomas Carlyle and Ralph Waldo Emerson' (1883), edited by C. E. Norton are the best editions of his letters. Froude's 'Thomas Carlyle' (in 4 vols., 1882–84) is the great biography, and is, incidentally, the most censured biography of recent times, because of the frankness with which it discloses the domestic life of the Carlyles. Excellent short lives are those of

John Nicoll, in the 'English Men of Letters Series' (1894), Richard Garnett, in the 'Great Writers Series' (1887) (to which there is added a very full bibliography), and Sir Leslie Stephen, in the *Dictionary of National Biography.* The critical essays of Matthew Arnold, Emerson in 'Discourses in America,' Augustine Birrell, 'Obiter Dicta', J. R. Lowell, 'Prose Works,' Vol. II, John Morley, 'Miscellanies,' Vol. I, J. M. Robertson, 'Modern Humanists,' the severest of Carlyle's critics, and Stephen, 'Hours in a Library,' Vol. III, may be cited as representing different views among the most eminent of modern critics. Consult also Froude's 'Letters and Memorials of Jane Welsh Carlyle' (1883); Roe, F. W., 'Carlyle as a Critic of Literature' (1910); Craig, R. S., 'The Waking of Carlyle' (1909); Wilson, 'Froude and Carlyle' (1898); Shepherd and Williamson, 'Memoirs of the Life and Writings of Thomas Carlyle' (1881); Wylie, 'Thomas Carlyle the Man and his Books' (1881).

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CARLYLE, William Arthur, Canadian mining engineer: b. Hamilton, Ontario, 1862. A graduate of McGill University in 1887, he afterward was appointed at his alma mater special lecturer in mining and metallurgy (1891–95), and in 1895 professor of mining and engineering. He was provincial mineralogist and director of the Department of Mines, British Columbia, for three years, and from 1898 to 1908 was general manager of the Rio Tinto Company's mines in Spain. In 1908 he settled in London, England, as a consulting engineer, and the following year received the appointment of professor of technology and metallurgy in the Imperial College of Science.

CARLYLE, Ill., city and county-seat of Clinton County, 45 miles east of Saint Louis, on the Baltimore and Ohio Southwestern Railroad, and on the Kaskaskia River. It has flour mills and paper manufactories and a large trade in flour and grain. It contains a county courthouse and a hospital. Carlyle was in pioneer times a station on the Vincennes trail. The electric-lighting plant and waterworks are the property of the municipality. Pop. 1,982.

CARMACK, Edward Ward, American politician: b. near Castalian Springs, Sumner County, Tenn., 5 Nov. 1858; d. Nashville, Tenn., 9 Nov. 1908. He studied law and after admission to the bar practised his profession at Columbia, Tenn. He was member of the State legislature in 1884; was on the editorial staff of the Nashville *American* (1886–88), and in 1892 became editor of the Memphis *Commercial.* He served two terms in Congress as Democratic representative from the 10th Tennessee district 1897–1901, was United States senator 1901–07, and later editor of the Nashville *Tennesseean.* In 1906 he contested the Democratic nomination for governor, but was defeated. He was assassinated 9 Nov. 1908 by Robin J. Cooper, son of his long-time bitter political opponent, Col. Duncan Cooper. He published 'Character; or, The Making of the Man' (1909).

CARMAGNOLA, kär-män-yō'la, **Francesco,** Italian *condottiere:* b. Carmagnola, about 1390; d. Venice, 3 May 1432. His real name was Bussone, but he adopted as his own the name of his birthplace. The son of a peasant, he was a herdsman in his youth; but enlisting in the service of the Duke of Milan (Filippo Maria Visconti), he rapidly rose in rank, and aided his master in regaining a great part of Lombardy, and in extending his possessions. The Duke, however, became suspicious of his loyalty, confiscated his property, cast his wife and children into prison and banished him; upon which Carmagnola entered the service of the republic of Venice, from which he received the appointment of generalissimo. He wrested Brescia from the Duke of Milan, and entirely routed his army at the battle of Macalo in 1427. After the battle he released his prisoners, which was frequently done at that time by *condottieri,* but incurring the suspicions of the Venetian senate for doing so, and his subsequent military operations not proving successful he was recalled to Venice, under the pretext that his advice was needed for affairs of state, placed under arrest, accused of treason, put to the torture and beheaded. His fate has been celebrated in Manzoni's tragedy, 'Il Conte di Carmagnola' (1820). Consult Brown, Horatio, 'Studies in Venetian History' (London 1907).

CARMAGNOLE, kär'män'yŏl', a name applied in the early times of the French republic (1792–93) to a song which was accompanied by a dance. The song contained 13 couplets and the following refrain:

> "Dansons la carmagnole
> Vive le son, vive le son
> Dansons la carmagnole,
> Vive le son du canon."

The author and composer of the song are unknown. It is notable simply for its historical associations, not for the intrinsic merits of words or music. The song and dance were first used at the time of the indignation of the people on account of the veto allowed to the King on the resolves of the National Assembly. The Carmagnole was commonly sung and danced at popular festivals, executions and eruptions of popular discontent. Afterward the name was also applied to the national guards, who wore a dress of a peculiar cut, and to the enthusiastic supporters of the Revolution. Several members of the National Convention — Barère, for instance — by way of jest, gave this name to their communications to the assembly.

CARMAN, Albert, Canadian Methodist bishop and college president: b. Iroquois, Ontario, 1833. A pupil of Dundas Grammar School and of Victoria University, Cobourg, he was graduated in 1855. He received the appointment of professor of mathematics in Albert College, Belleville, in 1857, the following year being selected principal. Ten years later in 1868 he was appointed first chancellor of Albert University, to which standard, with a charter in all the faculties, he had raised Albert College by his persistent and successful work. From 1876 to 1883 he was bishop of the Methodist Episcopal Church, having been ordained minister in 1859. When the various Methodist bodies united in 1883, Carman became general superintendent for over 30 years. He was also a senator of Toronto and Victoria universities, a governor of Wesleyan Theological College, Montreal, and was one of the founders of Alma Ladies' College, Saint Thomas. He made a missionary tour of the world in 1906. He was long known as a prominent force among the ranks of prohibitionists.

CARMAN, Bliss, Canadian poet and journalist: b. Fredericton, N. B., 15 April 1861. He was educated at the universities of New Brunswick, Edinburgh and Harvard. In 1890 he became office editor of the New York *Independent,* where he remained about two years; since then he has had editorial positions on *The Literary World, The Cosmopolitan* and several other magazines. In 1894 he was associated with the late Herbert S. Stone in founding the *Chap-Book,* the first of the little pocket magazines. He received the degree of LL.D. from the University of New Brunswick in 1906. His verse has been widely read and his successive volumes include 'Low Tide on Grand Prè' (1893); 'A Sea Mark' (1895); 'Behind the Arras' (1895); 'Ballads of Lost Haven' (1897); 'By the Aurelian Wall' (1897); 'Songs from Vagabondia,' joint author with R. Hovey (1894); 'More Songs from Vagabondia' (with Hovey) (1896); 'Last Songs from Vagabondia' (1900); 'A Winter Holiday'; 'St. Kevin,' a ballad (1894); 'St. Michaelmas' (1895); 'The Girl in the Poster' (1897); 'The Green Book of the Bards' (1898); 'The Vengeance of Noel Brassard' (1899); 'Ode on the Coronation of King Edward' (1902); 'From the Book of Myths' (1902); 'Pipes of Pan,' No. 1 (1902); 'Pipes of Pan,' No. 2 (1903); 'Pipes of Pan,' Nos. 3, 4, 5 (1904–05); 'Poems' (collected ed., 2 vols., 1905); 'Kinship of Nature' (1903); 'Friendship of Art' (1904); From the Book of Valentines' (1905); 'The Making of Personality' (1907) 'The Gate of Peace' (1907); 'The Rough Rider' (1909); 'A Painter's Holiday' (1911); 'Echoes from Vagabondia' (1912); 'Daughters of Dawn,' with Mary Perry King (1913); 'Earth Deities,' with M. P. King (1914).

CARMARTHEN, or **CAERMARTHEN** (Welsh, *Caer Fyrddyn*), South Wales, a seaport town, capital of Carmarthenshire, nine miles from Carmarthen Bay, Bristol Channel, and 14 miles northwest of Llanelly, on the right bank of the Towy. The principal buildings are the county hall, Saint Peter's Church, with some interesting monuments — one an altar tomb of the 16th century — and Saint David's Church. There are excellent schools, two infirmaries and a literary and scientific institution. There are some tin and lead ore works, cloth manufactories, slate quarries and iron foundries, and the salmon fishery is extensive. Carmarthen was the *Maridunum* of the Romans, and under the native Welsh Princes the capital of South Wales. Pop. 10,221.

CARMARTHENSHIRE, or **CAERMARTHENSHIRE**, South Wales, a maritime county and the largest of all the Welsh counties; extreme length, 45½ miles; breadth, 26 miles; area, 588,472 acres. It is mountainous generally, but not so rugged as some other Welsh counties. Some of the vales are beautiful, particularly that of Towy, which is 30 miles in length. This river and the Tave are the only navigable streams in the county. The valleys are fertile, and numerous herds of small black cattle are raised on the hills. The mineral products are copper, silver, iron, lead, coal, marble and building stone. There are considerable fisheries. The Rebecca Riots (1843–44), in opposition to turnpike gates, originated in the county. Carmarthenshire returns two members to Parliament. Pop. 160,406.

CARMAUX, kår-mō, France, a city in the department of Tarn, nine miles northeast of Albi by rail. It is one of the great coal-mining centres of France, the annual output sometimes reaching as high as 600,000 tons. Serious strikes and riots took place here in 1892. There are also glass manufactures. Pop. (1906) 8,618.

CARMEL. (1) A mountain ridge in Palestine, constituting part of Lebanon, on the southern frontier of Galilee, in the pashalic of Acca. It consists of several rich woody heights, separated by fertile and habitable valleys within a circuit of about 28 miles, and terminates at the mouth of the Kishon in a lovely plain, which forms the southern coast of the Gulf of Ptolemais or Acca, on the Mediterranean. Upon different parts of this mountain there are ruins of churches and monasteries from the time of the Christian kingdom of Jerusalem, and the cave which, according to tradition, was inhabited by the prophet Elijah. (2) A city of Judah, about eight miles southwest of Hebron. Eusebius mentions it and calls it a very great town. The modern city is Khirbet Kurmul.

CARMELITES, one of the four mendicant orders of the Roman Catholic Church; its full title is Friars of Our Lady of Mount Carmel. The order has, traditionally, a very ancient origin, but as a religious order approved by the Roman Catholic Church is contemporary with the Dominican and Franciscan orders. According to the legends the Carmelites trace the origin of their order back to the early days of the kingdom of Israel, the time of the prophets Elijah (Elias) and Elisha (Elisæus). Elias, in his early manhood, says the legend, retired for religious contemplation to Mount Carmel, and there, taught by an angel, gathered to himself a number of men of like disposition, and instituted a society of contemplatives for worship of the true God and the attainment of spiritual perfection. Among the disciples attracted to the school of religion were the youths who afterward were the minor prophets Jonah, Micah and Obadiah; and at a later period the renowned philosopher of Magna Græcia, Pythagoras, was numbered among the inquirers after the true religion and the science of divine things in this great school of the prophets: Pythagoras' instructor was the prophet Daniel. Elijah's wife instituted an order of female recluses. As pointing to the existence on Mount Carmel of some such institution as the legend postulates, reference is made to 1 Kings xviii, 19 and following; 2 Kings ii, 25; and 2 Kings iv, 25.

The world outside the precincts of those religious communities appears to have been entirely ignorant of this ancient institution till early in the 13th century, when Phocas, a Greek monk of Patmos, brought to the Latin Patriarch of Constantinople intelligence of the existence in olden time of a great monastic or eremitic establishment on Mount Carmel, of which traces still remained. The learned editors of the Acta Sanctorum were able to demonstrate that the present order owes its origin to the Crusader Berthold who, having become a monk in Calabria, took up his abode on Mount Carmel in 1156, with 10 companions. For these Phocas petitioned the patriarch to formulate or to approve a rule of monastic or eremitical life. This was done, and afterward the rule was approved by Pope Honorius III in 1224. The connection of this order with the ancient school of the prophets, even if the traditional story be accepted, seems to lack proof. All that we are told which could give color to the claim that the new eremites are in the line of succession from the eminent school of prophets is, that in a vision Elias gave orders to the monk from Calabria to found a religious establishment on the ancient site. The community was expelled by the Saracens from its seat on Mount Carmel and took refuge in the West. One of the earliest houses of the Carmelite order in the West was founded at Alnwick in England; and about the same time, near the middle of the 13th century, Saint Louis the King, founded at Paris the first Carmelite house in France — the *Carmes*, of terrible celebrity in the great Revolution. Pope Innocent IV modified the rule of the order and assimilated it to the Dominican and Franciscan rule. One of the traditions represents Jesus and his mother as initiates of the ancient order; and Saint Simon Stock, sixth general of the order, an Englishman, received from the hands of the Virgin the scapulary of Mount Carmel with the assurance that whoso should die wearing that scapulary would surely not be damned. A relaxation of the primitive severity of the rule was permitted by Eugenius IV in 1431, and this led to a scission of the order into two suborders, the Conventuals or Calced (wearing shoes) and the Observants or Discalced (shoeless or barefooted). Pope Benedict XIII in 1725 permitted the order to add to the statues in Saint Peter's Church of founders of religious orders one to their founder, which was erected with the inscription: «Universus Ordo Carmelitarum Fundatori suo Sancto Eliæ prophetæ erexit» («The whole order of the Carmelites erected this statue to their founder, Saint Elias the prophet»). The order of Carmelite nuns dates from the middle of the 15th century. In 1562 the great mystic Saint Teresa, who was a Carmelite nun, in virtue of a papal brief established a separate branch of the sisterhood, under a very severe rule: these are the Barefoot Carmelite Nuns. She then undertook to restore in the original order of Carmelite Friars the ancient severity of discipline, and succeeded; the result is the order or suborder of the Barefoot or Discalced Carmelites. The Carmelite order, in its several forms, has establishments all over the world. The headquarters of the order in America are at Niagara Falls.

CARMEN. Mérimée's short novel, ‘Carmen,’ is probably less known than the opera to which it gave its name. This story, like many of Mérimée's literary productions, appears merely as an incident in the course of more serious work. Indeed, it begins with an archæological discussion and ends with a dissertation on gypsy dialects and manners. The intervening 90 pages contain however a vivid picture of gypsy life in Spain in its strangest and most picturesque features. Mérimée's travels in Spain, his acquaintance with the history of the country, its literature, its language and dialects, including the difficult Basque and that of the Romani or gypsies, furnished him abundant material for his story. This material he handles in his impersonal manner, with a logical development, a precision and a finish of style which make of his works little gems of literary achievement. In spite of his detached attitude toward his characters, he endows them with an impressive or rather oppressive realism. Few characters in French literature are more skilfully drawn or more strongly alive than those found in Mérimée's stories. In ‘Carmen,’ the heroine is a romantic conception of the classic *Gitanilla* of Cervantes. She combines the virtues and vices of her race carried to extremes. In her many-sided rôles, either as cigarette-maker, a fortune teller, a secret agent of highwaymen and smugglers, or as the fun-loving dancer and the devoted nurse of her wounded companions, she is intensely passionate or revengeful, greedy or extravagant, selfishly sensuous or ideally self-sacrificing, but always exercises a strong fascination upon all of those who willingly or unwillingly come under her fateful influence. This fascination has transformed the hero, Don José, from an honest sergeant in the army into a smuggler, a bandit and a murderer, when, driven by jealousy, he stabs Carmen herself after he had gained undisputed possession of her by killing her gypsy husband in a trumped-up duel.

Although such adventures and strange pictures may startle and puzzle the reader, they nevertheless leave a strong impression because in spite of an exaggerated individualism, they show a solid humanistic foundation, and on the part of the author an accurate sense of observation even if tinged with a certain dilettantism and indifference bordering on cynicism. Dramatized by Meilhac and Halévy, ‘Carmen’ was set to music by Bizet and played for the first time in Paris on 3 March 1875; since then it has been one of the most popular operas of the French school. Consult Ives, George Burnham (translator), ‘Carmen and other stories’ (New York 1903).

L. A. Loiseaux.

CARMEN, an opera comique in four acts by Georges Bizet (libretto by Meilhac and Halévy, founded on a tale by Prosper Mérimée) first produced at Paris on 3 March 1875. Not only Bizet's masterpiece, but the greatest opera that has come out of France, ‘Carmen’ was not at first a success, and the coolness of its reception is generally believed to have hastened the composer's death, which occurred three months later. The story of the beautiful Spanish gypsy, flirtatious and fickle, cruelly oblivious to the ruin she spreads, until her career is tragically ended by Don José, one of her lovers, is familiar to every opera-goer. There is no more popular song in the modern repertory than that of the Toreador with its graphic portrayal of the character of Escamillo, the bull-fighter. In the Habanera, sung by Carmen in the first act, use is made of an old Spanish song; but except in that instance, the music is all Bizet's and not the least noteworthy fact is its convincing Spanish color, as realistic and as warm as a Sorolla painting. The rhythmic lilt of the Seguidilla, with which Carmen subjugates Don José, and of her dance with castanets in the second act, is not easily forgotten. Indeed, the whole score is a mine of rhythm of inexhaustible variety. The romantic charm of Michaela's aria in the third act is so compelling as easily to overcome the natural reluctance of the most celebrated prima donna to taking second place. While the Wagnerian influence is in a general sense present in the orchestral portion of Carmen, harmonically and rhythmically it is Bizet alone; and his originality and dramatic power as displayed in this work (think of the eloquent Fate *motif*) suggest that he might have risen to the greatest heights had he lived beyond the short 37 years of life permitted to him. It was Nietzsche who said: «Bizet was the last genius to discover a new beauty.— Bizet discovered new lands — the Southern lands of music.» Carmen has always enlisted the powers of great dramatic singers. The original was Mme. Galli-Marie. Minnie Hauck introduced the rôle in London and New York. But the greatest of all Carmens was Emma Calvé, who made her American début in 1893. Her sensational performance was long before the public in this country and will not soon be forgotten.

LEWIS M. ISAACS.

CARMEN SECULARE. See HORACE.

CARMEN SYLVA, pen name of ELIZABETH, Queen of Rumania (q.v.).

CARMI, Ill., city and county-seat of White County, 150 miles southeast of Springfield, on the Louisville and Nashville Railroad and the Little Wabash River. It is the centre of an agricultural region and exports fruit, grain, flour, tile and lumber. It has flouring and saw mills, brick works, machine shops, a stave and heading factory, an ice factory, etc. Pop. (1910) 2,833.

CARMINATIVES, remedies that cause a warm, pleasant sensation in the stomach and act as stimulants to the muscles, causing peristalsis, thus relieving flatus; and that increase the flow of the gastric and intestinal secretions. Most of the drugs containing volatile oils are carminatives; as, the mint family, parsley, anise, fennel, caraway, cardamon, ginger, cinnamon, cloves, etc. See VOLATILE OILS.

CARMINE, the most splendid of all the red colors, is made from cochineal insect, or *Coccus cacti.* It was first discovered by a Franciscan monk at Pisa, while compounding some medicine containing cochineal, and in 1656 it began to be manufactured. The finest is that which is thrown down from an aqueous infusion by chloride of tin. This, after depositing, is collected and dried. The operations require the greatest care, for the brilliancy of the color is affected by the weather, light and temperature. The color produced by alum has a darker tint, and constitutes lake. Carmine, or carminic acid, is also the name given by chemists to the coloring matter of cochineal. The acid is a purplish body, extremely soluble in water and in alcohol. It forms salts with the heavy metals, and it yields various products when acted on by chlorine, nitric acid and other reagents. Carmine is used to some extent in dyeing, in water-color painting, to color artificial flowers, confectionery, etc.

CARMONA (ancient CARMO), a town in Spain, 20 miles from Seville, on a height overlooking a large plain covered with olive-trees. It is well built, containing many handsome mansions belonging to the nobility, who though usually resident in Seville spend part of the year there. The principal square is well planted, and, among other edifices, possesses a handsome Gothic church with lofty spire. Another conspicuous object is a Moorish castle, flanked with massive towers, and there are two old Roman gates. The manufactures are chiefly woolen hats, leather and earthenware. Recent important excavations on the site of the ancient necropolis, to the west of the modern town, have brought to light a large number of tombs and funeral triclinia in almost perfect preservation. Considerable portions of the Moorish wall and Alcazar still remain. The city retained its prominence throughout the Middle Ages. It fell into the power of the Moors, but was recaptured by Saint Ferdinand of Castile in 1247. Consult M. Sales y Ferré, 'Estudios arqueológicos é históricos' (Madrid 1887). Pop. 18,855.

CARMONTEL, kär-môn-tĕl, or **CARMONTELLE, Louis Carrogis**, French poet: b. Paris, 15 Aug. 1717; d. there, 26 Dec. 1806. He is best known by his 'Proverbes dramatiques' (10 vols., Paris 1768–81, new ed., 4 vols., Paris 1822). These are without much connection in themselves, being, in fact, only a series of dramatic scenes, but are well adapted for private theatres. The fertility of Carmontel was as extraordinary as his ease in writing. His 'Théâtre de campagne,' a collection of more than 25 comedies, was published in 1775 (4 vols.). He painted portraits, mostly profiles, of some of the most eminent persons of the 18th century. 'Proverbes et comédies posthumes de Carmontelle' was published, with a memoir by Mme. de Genlis (3 vols., Paris 1825).

CARNAC, kär-nak, France, a Breton village in the department of Morbihan, on a height near the coast 18 miles southeast of Lorient, and remarkable for the so-called Druidical monuments in its vicinity. These consist of more than 1,100 rude blocks of gray granite, some of which are upward of 18 feet high, standing on end in the midst of a wide heath. They are in the form of unpolished obelisks, with the vertex reversed, and are arranged in 11 lines, forming 10 avenues, with a curved row at one end. There are many gaps in the lines; almost every house and wall in the vicinity is seemingly built from this artificial quarry. They are evidently of very ancient date, but their origin is unknown. At a distance of a mile and a half from Carnac there is a wonderful group of mounds called the Bossenno, and the remains of a Gallo-Roman town were uncovered in 1874. Pop. 3,250. Consult Lukis, 'Chambered Barrows and Other Historic Monuments in Morbihan' (1875); Miln, 'Excavations at Carnac' (1877–81); Worsfold, 'The French Stonehenge' (*British Archæological Association Journal.* 1898).

CARNALL, Rudolph von, German mining engineer: b. Glatz 1804; d. 1874. He began the study of mining in Berlin in 1823, was connected with the mining industry in Upper Silesia and rose to be superintendent of mines and director of the general mining office in Breslau. He took part in founding the German Geological Society, lectured at the University of Berlin on the science of mining engineering, and rendered important service to the development of German mining. He was councillor in the mines and mining section of the Prussian Ministry of Commerce from 1855 to 1861. The *Zeitschrift für das Berg-, Hütten-und Salinenwesen im preussischen Staate* was founded by him.

CARNALLITE, a hydrous double chloride of potash and magnesium, one of the principal potash-yielding minerals of the great German potash deposits at Stassfurt, Germany. In composition it consists of potassium chloride, 26.8 per cent, and magnesium chloride, 34.2 per cent. Its equivalent in potash is 14.1 per cent.

CARNARVON, kär-när'vŏn, **Henry Howard Molyneux** (4th Earl of), English statesman: b. London, 24 June 1831; d. 28 June 1890. He received his education at Eton and Christ Church, Oxford, taking his degree in 1852. After this he spent several years in travel in the Orient. He succeeded his father in the earldom in 1849, and was secretary of state for the colonies, June 1866 to March 1867. He was chosen high steward of Oxford University and created D.C.L. (1859). During his secretaryship he devised a scheme for the federation of the British North American Colonies, subsequently approved by Parliament. He was again colonial secretary, 1874–78, and lord-lieutenant of Ireland, 1885–86. He published 'The Druses of Mount Lebanon' (1860); an address on Berkshire Archæology (1860); edited 'Reminiscenses of Athens and the Morea by the late Earl of Carnarvon,' his father, and published translations of the 'Agamemnon' (1879), the 'Odyssey' (1886), and 'Prometheus Vinctus' (1893).

CARNARVON, or **CAERNARVON,** Wales, a seaport town and parliamentary borough, on the southeast side of the Menai Strait, and capital of the county, 209 miles northwest of London. The ancient walls thrown around it by Edward I, and flanked by round towers, are still fairly entire. The magnificent castle or palace of Edward I, and in which Edward II was born, stands at the west end of the town, almost overhanging the sea, and is externally entire. Including its courtyards, etc., it covers about two acres of ground. There are extensive ironworks in the town, which supply machinery for steamers, etc. The chief exports are copper ore, coal and slates, of which the town is a centre of distribution for the neighborhood. It is much frequented by summer tourists. Consult Hartshorne, 'Carnarvon Castle' (in the *Archæological Journal,* Vol. VII, London 1850).

CARNARVONSHIRE, or **CAERNARVONSHIRE,** a maritime county of North Wales, having Carnarvon Bay on the west; Denbigh on the east; the island of Anglesea and the Irish Sea on the north and Cardigan Bay on the south. Its extreme length, southwest to northeast, is about 52 miles; extreme breadth, 20 miles, although the greater portion of it does not exceed seven or eight miles on an average; area, 365,986 acres. This county is traversed throughout its whole length by lofty mountains, including the Snowdon range, whose highest peak is 3,557 feet above the sea. There are other summits varying from 1,500 feet to more than 3,000 feet. Dairy farming, and cattle, horse and sheep breeding are the principal occupations of the farmer. The cattle and sheep are of a small breed. Lead, zinc and copper ores are found in the mountains in the south, and granite is worked; but slate is the principal mineral product of which there are extensive quarries at Bethesda. The county returns two members to Parliament. Pop. 125,043.

CARNATIC, kär-năt'ĭc, former province of British India, on the east coast of the peninsula. Its limits were ill defined, but it is commonly thought to have extended from Cape Comorin to lat. 16° N., and from the coast line to an average of about 80 miles inland. It was formerly included in the dominions of the Nabob of Arcot, and the contentions arising from a disputed succession first brought the French and English into collision, and ended by the subjugation of the Carnatic under the British influence, which was completely effected in 1801. The Carnatic as one of the wealthy provinces has been the cause of endless native warfare and bloodshed, by which, whoever was victor, the unhappy cultivator suffered in the end; as each successive ruler, feeling his tenure uncertain, cared only to make revenue while the power lasted, an example which was but too closely imitated by his unscrupulous ministers and officials. The Carnatic is now included within the administration of the presidency of Madras.

CARNATION, a half-hardy perennial herb (*Dianthus caryophyllus*) of the family *Silenaceæ,* a native of southern Europe. It has more or less erect stems with enlarged joints, linear opposite leaves covered with a bloom, and solitary, variously colored, terminal, perfumed flowers, which naturally appear during summer, but which are produced artificially in certain varieties throughout the year. The plant has been in cultivation for its flowers for more than 2,000 years, but not until the early years of the 16th century did its flowers become greatly differentiated from their original flesh tint, which suggested the popular name (Latin *carnatio*). So numerous became the varieties that systems of classification were adopted. The popular European system of today is: (1) «Selfs,» flowers of one color; (2) «flakes,» flowers with yellow or white ground and striped with either rose, scarlet or purple; (3) «bizarres,» resembling flakes except that they are striped with more than one color; (4) «picotees,» with white or yellow petals margined with red, etc. The summer-blooming carnations which suggested this classification are little grown in America, but are very popular in Europe. They seem to demand a moist, cool climate. The group most cultivated in America, known as perpetual-flowering tree, or monthly carnations, originated in France about 1840 as the result of crossing and selection. The first of these varieties imported into America is said to have arrived in 1856, since when the growing of carnations under glass as a crop has developed. The extent of the industry is very great and is steadily growing. According to the census report of 1900 the value of the carnation crop in 1899 was about $4,000,000, produced in about 9,000 American commercial greenhouses.

Propagation of the monthly carnations is usually effected by means of cuttings of young stems. When well rooted they are potted in good soil and kept until late spring, when they are transplanted to the open ground or to the benches where they are to blossom. A winter temperature ranging between 50° and 55° at night and preferably only 10° higher during the day is desirable. At the end of the winter they are thrown away.

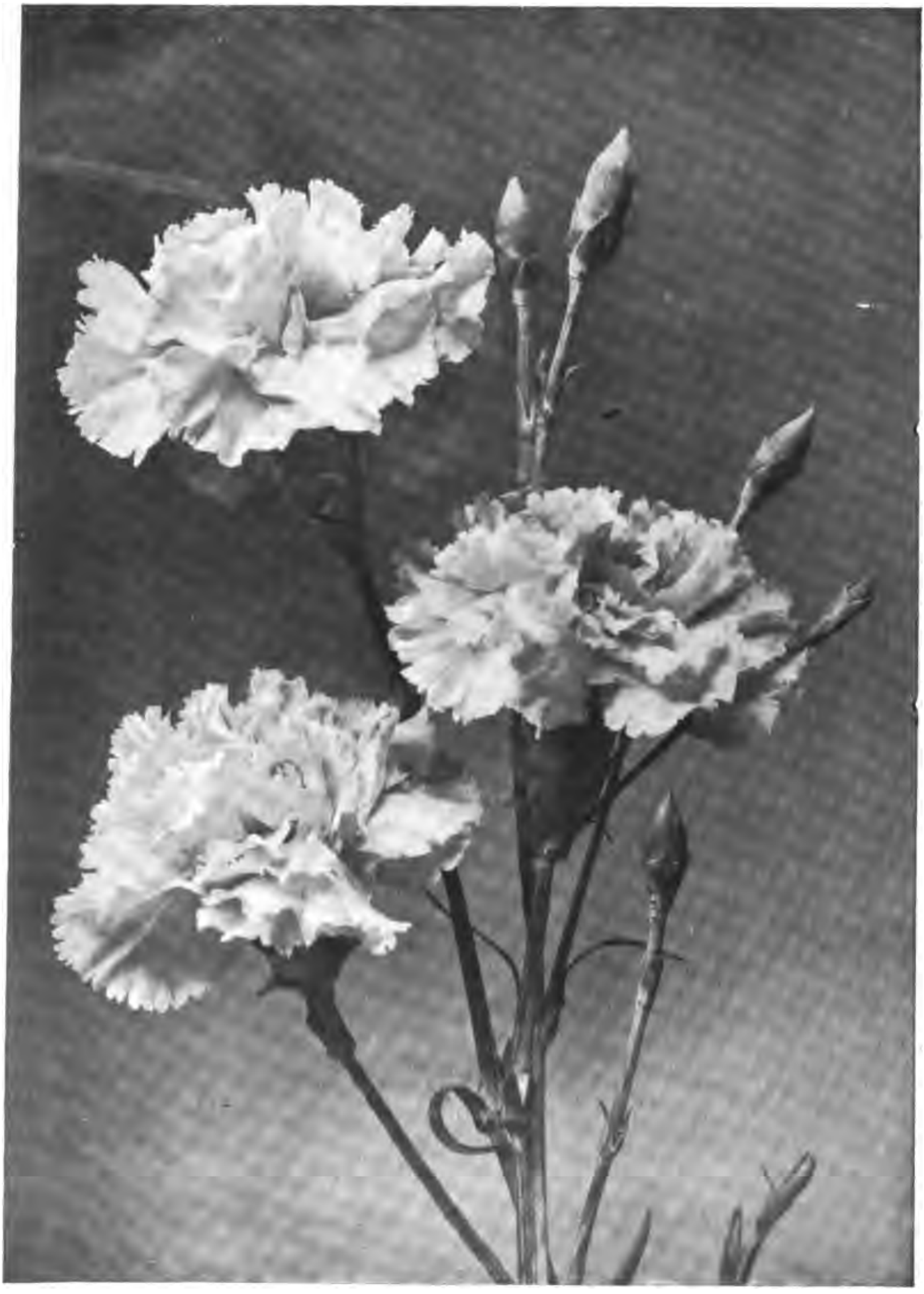
The most common insect pests of the carnation are the red spider and the green aphis. The red spider thrives best in dry atmosphere, and is most easily controlled by syringing with water and evaporating (not burning) sulphur in the greenhouse once a week for about five weeks, when the insects become troublesome. The green fly or green aphis seems to thrive under any ordinary conditions. It is usually fought with tobacco fumes of various extracts of tobacco. Three fungous diseases are often troublesome, rust (*Uromyces caryophyllinus*), spot, or blight (*Septoria dianthi*), and anthracnose (*Volutella Sp.*). These are largely prevented by judicious management, and when they occur may be controlled by destroying diseased plants and by spraying with Bordeaux mixture (See FUNGICIDE). Rust appears on the stems and leaves as blisters which break and expose brown spores. Spot consists of brown dots with black centres where the spores are borne. Anthracnose is characterized by grayish-brown spots. (Bailey, 'Cyclopedia of American Horticulture,' New York 1914). Thirty-seven acres of land are devoted to the raising of carnations at a nursery in Los Angeles, Cal. Nine greenhouses, each 200 feet long and 15 feet wide, together holding 35 tons of glass, are used to raise the young plants.

CARNATION (Latin, *caro, carnis,* "flesh"), in painting, the representation of the color of flesh. It is also used in the fine arts to signify the nude or undraped parts of a figure. The use of carnation requires very attentive study and great skill in the artist. It varies with the sex of the individual, with the classes and countries to which the subjects belong, with the passions, the state of the health, etc. The cheeks are, in a healthy subject, of a lively red; the breast, neck and upper part of the arms of a soft white; the belly yellowish. At the extremities the color becomes colder, and at the points assumes a violet tint, on account of the transparency of the skin. All these shades require to be softly blended. Two faults in carnation are chiefly to be avoided,— hardness, the fault of the masters of the 15th century, and too great weakness. Guido Reni not infrequently painted his flesh so that it appeared almost bloodless. The French school has gone farthest in this respect. The flesh of the followers of this school often looks like porcelain or wax. Titian and Rubens are unrivaled in carnation.

CARNAUBA, kär-nä-oo'bą, the Brazilian name of the palm, *Copernica cerifera*, which has its leaves coated with waxy scales (whence the name wax-palm), yielding a useful wax by boiling. It withstands drought excellently. A slight saline composition in the soil produces the best trees. The fruit and pith are eaten, the leaves are variously employed and the wood is used in building.

CARNEADES, Greek philosopher: b. Cyrene, Africa, about 214 B.C.; d. 129 B.C. The date of his birth is uncertain. Cicero states he was 90 years old at the time of his death, which would place his date of birth in 219 B.C. He studied first under Diogenes the Stoic, but subsequently attended the lectures of Egesinus, who explained the doctrines of Arcesilaus; and succeeding his master in the chair of the Academy, he restored its reputation by softening the prevailing pyrrhonism and admitting practical probabilities. The doctrine of Carneades specifically was, that "as the senses, the understanding, and the imagination frequently deceive us, they cannot be the infallible judges of truth, but that from the impression made by the senses we infer appearances of truth, which, with respect to the conduct of life, are a sufficient guide." He was a strenuous opposer of Chrysippus, and attacked with great vigor the system of theology of the Stoics. He was an advocate of free-will against the fate of the same sect, and urged just the same difficulties in reconciling divine prescience with the freedom of human actions as have divided some contending sects of Christianity. One of the most distinguished events of his life was his being joined in an embassy to Rome with Diogenes the Stoic and Critolaus the Peripatetic, in order to gain the mitigation of a fine levied by the Roman Senate on the Athenians. This extraordinary embassy was successful, and Carneades so captivated the people by his eloquence, one day delivering a harangue in praise of justice, and on the next proving it to be an odious institution, that Cato the censor, fearful of its effect on the Roman youth, persuaded the Senate to send the philosophers back to their schools without delay. In his latter years Carneades became totally blind and continually complained of the shortness of life, lamenting that the same nature which composed the human frame could dissolve it. Consult Hicks, 'Stoic and Epicurean' (New York 1910).

CARNEGIE, Andrew, American ironmaster, manufacturer and philanthropist: b. Dunfermline, Scotland, 25 Nov. 1835. None even of the mighty makers of their own fortunes began closer to absolute zero; certainly none who have owed success not to fortunate speculations, but to steady labor, sagacity and self-culture, the natural working of the highest powers on opportunities open to all and less to him than to most. His father owned a small hand-loom business, which was closed in 1848 by the competition of steam. He then emigrated to the United States and settled in Allegheny City, Pa. The 10-year-old child here became a bobbin-boy at 20 cents a day; his alertness in a few months brought him transference to an engine-room, his penmanship and arithmetic a chance to do clerical work. Next a telegraph messenger boy at Pittsburgh (with a mother and younger brother to support from his slender wages), he promptly mastered telegraphy, was soon given a place as operator, and won himself extra earnings and experience in composition as a newspaper telegraph reporter. Superior fitness brought him the post of telegraphic train dispatcher to the Pennsyl-



Photograph by J. Horace McFarland Co.

CARNATION

vania Railroad; then of secretary to its general superintendent, Colonel Scott; and in 1860, when his chief became vice-president, Mr. Carnegie was made superintendent of the Western Division. Meantime his business fortune had opened with the tentative adoption by the road, through his agency, of the Woodruff sleeping-car system, in which he shrewdly embarked some borrowed money; his expert knowledge made it investment, not speculation; and his dividends went partially into oil lands around Oil City, selected with equal judgment. At the outbreak of the war, Colonel Scott was made Assistant Secretary of War, and gave Mr. Carnegie charge of the eastern military railroads and telegraph lines, and of this department there was no complaint or scandal, and no breakdown except of Mr. Carnegie's health from overwork. He was also the third man wounded on the Union side, while removing obstructions from the Washington tracks.

Already a small capitalist, in 1862 the Pennsylvania road's experiments in replacing wooden with iron bridges led him to forecast the future monopoly of the latter, and organize the Keystone Bridge Works, which built the first iron bridge across the Ohio. To increase their profit by furnishing their own iron, he entered the field which has made him one of the industrial sovereigns of all time. The first step was the erection of the Union Iron Mills, furnaces and rolling mills; the last, after inspection of the Bessemer process in England, to establish it in this country in 1868. The story since is one of swift aggregation of plant to plant, till they have dominated their class, and become one of the chief industrial factors of the entire business world in this its greatest age. By 1888 he had acquired a controlling interest in his foremost rival, the Homestead Steel Works, and in seven other immense establishments centred around Pittsburgh; in 1899 he consolidated all these into one giant structure, the Carnegie Steel Company; and in 1901 he retired from business life, transferring his company at a valuation of $500,000,000 to be merged into one still vaster, the United States Steel Corporation, formed by J. Pierpont Morgan. His United States residence is in New York; his summer establishment at Skibo Castle, in the extreme north of Scotland.

Such supreme success, fairly won in a struggle with the world, is of course the result of a supreme individual genius not to be taught or explained, but as the amount of work any one man can do unassisted is a trifle, the chief instrumentality is always the faculty of organization. Mr. Carnegie himself once said that the organization *was* the business; that if stripped at a blow of all his material property and business connections, but left his organization, in four years he would have re-established himself. But the organization is simply the men who work it, with their capacity of selecting capable subordinates, and understanding public needs and the means of supplying them; and this leaves the faculty of creating and sustaining it no nearer solution than before. In the last analysis it means a nicely accurate judgment of *men*, resulting from an intuitive gift informed and tested by long experience; and as men are not pawns, it implies the power of persuading them into and keeping them in alliance as well.

Always a generous and helpful man, he had definitely begun, a few years before his retirement, a new existence consecrated to public service, and to which he will owe enduring remembrance. Another generation would have forgotten the mere business man, however great; for after all it would have had steel from some source, if perhaps less cheaply; but it could not have had from lesser men, and would not have had from any, the splendid, judicious and permanently useful gifts with which he has endowed it, and which no change of social ideals can render obsolete or harmful. No one has ever so royally returned to the public what he had (to its own benefit) drawn from the public. This is his own expressed conviction of duty; that «surplus wealth is a sacred trust to be administered for the highest good of the people,» and that sometime «the man who dies possessed of millions free and ready to be distributed, will die disgraced.» But he is equally emphatic in declaring that indiscriminate giving is mostly sheer mischief, and that no person and no community can be permanently helped except by their own co-operation. Therefore, every gift of his to a community is conditioned on the latter supporting it; and all those to institutions are thought out, and so bestowed that they forward the work without impairing the springs of public interest, or the ties to the public, which must after all be their permanent stay. These gifts are mostly not to charities in the current sense, relief of material distresses, for which the spirit of human brotherhood should be adequate; but for that mental and spiritual cultivation which should raise communities out of the lowest plane of social evils. An apparent exception, which, however, is not charity but justice and business sense, is the endowment of $4,000,000 given for an annuity fund to the workers at Homestead. The remainder of his benefactions may be divided broadly into institutions for research and the discovery of fertile new ideas; those for teaching the best of ideas and their practical appliances already known; and those for storing the results of knowledge and creation and distributing them to the public — in a word, universities, colleges and technical schools and libraries. Even the organs he has presented to several hundred churches may be classed in this category; as he genially observed, he is willing to endorse unreservedly all the utterances of the organs, but not of the preachers. The greatest single foundation will be the Carnegie institute at Pittsburgh an enormous technological school, with library, art gallery and every imaginable accessory,— the people's college of what he thinks the coming type,— which has received $25,000,000 in all.

Next is the Carnegie Institution (q.v.) at Washington, to promote original research and enable original workers to use their whole time for study, experiment and creation; perhaps his most valuable benefaction ultimately, since new ideas are at once the scarcest and the most valuable items of the world's income, and the work of one great man outweighs that of 10 generations of small ones. Of the others, perhaps the most useful, considering the work, and the chief, is the gift of $600,000 to the Tuskegee Normal and Industrial Institute in Alabama, conditioned on the trustees using enough of its income annually to free its president from money cares and the need of “drumming” support for his college. Sixty-five libraries in New York have received $5,200,000, one in Saint Louis $1,000,000, and two in Detroit and San Francisco $750,000 each; libraries at Homestead, Braddock and Duquesne $1,000,000; and the universities in Scotland $10,000,000. In 1905 he established the Carnegie Foundation of $10,000,000, the income from which provides retiring pensions for teachers in colleges, universities and technical schools; and in December 1910 a Peace Fund of $10,000,000; $5,000,000 to the Carnegie Hero Fund Commission, Pittsburgh; $1,500,000 to the Carnegie Hero Fund Trust, Dunfermline, Scotland; and the following amounts to various Hero Funds: France $1,000,000; Germany $1,500,000; Belgium $230,000; Denmark $125,000; Holland $200,000; Sweden $230,000; Switzerland $130,000; Italy $750,000; Norway $125,000.

He has also given $3,500,000 to the Carnegie Dunfermline Trust; $1,500,000 for the Peace Temple at The Hague; $1,500,000 to the Allied Engineers' Society; and his total benefactions exceed $300,000,000, including over $60,000,000 for over 3,000 municipal library buildings; also the building and grounds for the Pan-American Union, Washington, 1906; $16,150,000 for Foundation for the Advancement of Teaching in United States, Canada and Newfoundland.

He is a life trustee of the Carnegie Corporation of New York ($125,000,000) which was founded to carry on the various works in which he has been engaged and to which he announced in 1912 that he had given all his fortune except $25,000,000. He was lord rector of Saint Andrew's University in 1901–02 and 1906, and of Aberdeen University in 1912.

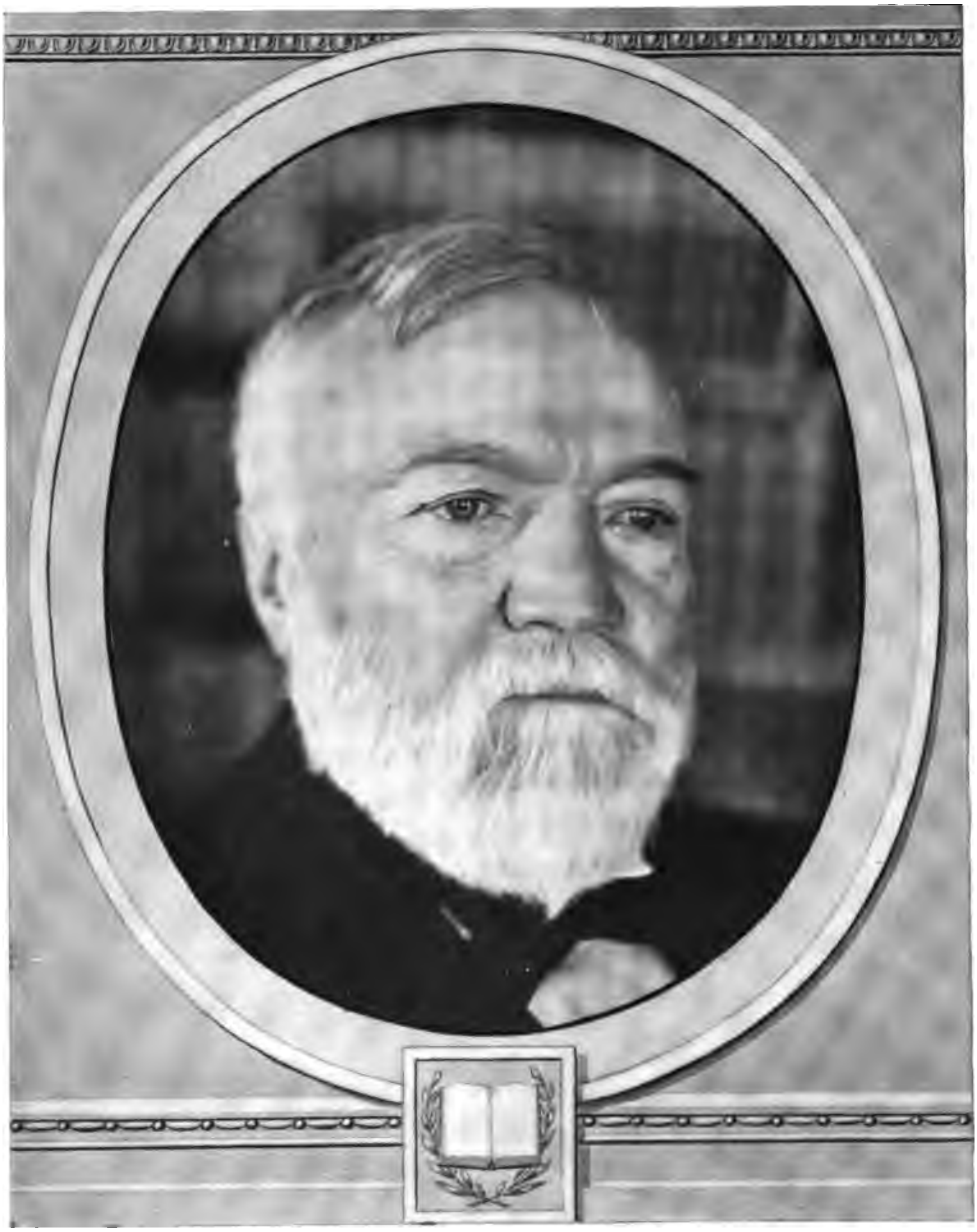
Mr. Carnegie has also won fame as an author. His first works, ‘Notes of a Trip Around the World’ (1879) and ‘Our Coaching Trip’ (1882) were printed first for private circulation, but published in consequence of the great pressure for private copies. ‘An American Four-in-Hand in Britain’ (1883) and ‘Round the World’ (1884) followed; but his greatest success was attained with ‘Triumphant Democracy’ (1886), which sold 40,000 copies within two years. ‘The Gospel of Wealth’ (1900); ‘The Empire of Business’ (1902, since translated into eight languages); ‘James Watt’ (1906); and ‘Problems of To-day’ (1909) have maintained his reputation as a clear, forcible and interesting writer and thinker. Consult Alderson, ‘Andrew Carnegie: the Man and His Work.’

CARNEGIE, Pa., borough in Allegheny County, five miles southwest of Pittsburgh, on the Pittsburgh, Cincinnati, Chicago and Saint Louis, the Pittsburgh, Chartiers and Youghiogheny and the Wabash Pittsburgh railroads. It has a Carnegie library, an Elks' Home, a high school and a fine orphan asylum. It is the centre of a coal-mining region and has extensive steel works. There are also lead works and manufactures of granite ware and stoves. In 1914 there were 432 persons engaged in manufactures in 19 establishments, the salaries and wages amounted to $328,000, the capital invested amounted to $2,202,000, the value of the materials used was $902,000, and the value of the products amounted to $1,724,000. The borough was formed in 1894 by the consolidation of Chartiers and Mansfield. It is governed by a burgess, who is chosen for a term of three years, and a council. Pop. (1910) 10,009; (1914) 11,000.

CARNEGIE DESERT LABORATORY, one of the most important of all the many research departments allied with the Carnegie Institution at Washington, situated near Tucson, Ariz. In connection with the department of botanical research, this laboratory was established in 1903 and almost at once took its place among the great institutions of the world. It concerns itself chiefly with the plant life of the desert, seeing how the impoverished plants which grow there can be made to thrive and improve and become of benefit to mankind, and is a movement of great agricultural import.

The equipment of the Carnegie Desert Laboratory is in proportion to the elaborate work undertaken there. The area of ground embraced for experimental work comprises 860 acres, situated just west of Tucson. Within this tract Tunamoc Hill rises to a height of 800 feet above the lower mesas. These topographical features present a wide range of varied conditions for plant growth. The laboratory proper is located half-way up the hill, and the entire grounds are fenced in. The laboratory forms three sides of a quadrangle 126 feet long with a short axis of 85 feet. Besides this is a small glass house for experimental purposes along special lines, and also a workroom.

The laboratory is conducting interesting work on Alpine and Austral plantations, located on the mountains, for the furtherance of which work it is provided with a complete pack equipment, including two pairs of heavy rawhide kyacks suitable for transporting instruments without damage. Although the greater part of the departmental work is carried on here, it is essential to a comprehensive study of desert plant life to explore distant as well as adjacent arid regions and much important work has also been carried on in the Salton Basin, where it has been established that the highly specialized flora is of comparatively recent origin. This basin and its accompanying vegetation have suggested experiments relative to the influence of altitude and climatic factors upon vegetation. To carry on these, plantations have been established on the Santa Catalina Mountain at various altitudes, ranging from 2,300 feet to 8,000 feet in height. Thermometric observations are made at each of these plantations. Culture has also been carried on at the tropical station at Cinchona, island of Jamaica, for comparisons. In order to obtain more complete comparisons the establishment of a station is now being contemplated in the San Francisco Mountain in northern Arizona, having an elevation of about 12,000 feet. Notable experiments have also been made in demonstrating the movements of vegetation over desert areas, and the distribution of native and alien plants. This study has been greatly facilitated by a topographical survey and a geological survey, both of which were conducted under the direction of the University of Arizona. Twelve well-defined plants were considered by the staff in this field of science, and various stations established, to demonstrate correlate plant be-



ANDREW CARNEGIE

havior with known factors of environment, with special attention to water supply, conditions of soil, exposure and drainage.

Other notable work of the laboratory has been the measurements of bodies of certain succulents in which the storing of water has been developed; experiments in the physiology of stomata, covering research in relation to the colors in flowers. In this, convincing data have been collected through the agency of the dark room, starvation and feeding. Similar investigation has been made in regard to the topography of chlorophyll masses, one of the distinct characteristics here noted being the depth to which the chlorophyll has been deposited in some desert plants, primarily, it is believed, because of the highly intensified light of the desert regions. Experiments have also been carried on in regard to the habits of roots in the desert regions, with comparative results obtained in the New York Botanical Gardens and data from the Jamaica institution. A great deal of highly interesting work has also been done in studying the water storage capacity of certain desert plants. Many specimens which grow in the desert have developed this capacity to a remarkable extent in order to tide them over through the long droughts which often occur there. The work of the Carnegie Desert Laboratory is thorough and exhaustive. It is not spectacular, since years are often required before even a single fact can be absolutely assured, but the work is cumulative in its nature, and in the future its importance will be adequately realized by the nation at large, and particularly by that portion of the population which is interested in the deserts of the West and other cultivation.

CARNEGIE ENDOWMENT FOR INTERNATIONAL PEACE, an institution created and maintained by a fund of $10,000,000 set apart by Andrew Carnegie in 1910. The purpose of the Endowment, as outlined by one of its prominent active members, Dr. Nicholas Murray Butler, president of Columbia University is «to work for the promotion of peaceful development of civilization by aiding and developing, supporting and directing the forces needful to bring about the prevention of war, the perfection of means for the establishment of arbitral justice between nations, and the development of a world congress or parliament, a high international court, and an international police, and to take such steps and promote such undertakings as shall bring about the substitution of law and justice for war as a means of settling international disputes and difficulties.»

The trustees selected by Mr. Carnegie to receive the fund and administer its income met at Washington on 14 Dec. 1910. At this meeting Mr. Carnegie read a letter informing the trustees of his gift of $10,000,000 in 5 per cent first mortgage bonds, the revenue of which, he stated, «is to be administered by you to hasten the abolition of international war, the foulest blot upon our civilization.» The donor made no restrictions of the gift, but left discretionary with the trustees the expenditure of $500,000 annually accruing from the fund; he did not attempt, moveover, to outline future action as regards the measures, methods and policies that were to be adopted to the end of accomplishing the purpose specified. The only stipulation made was that the trustees were to «keep unceasingly in view, until it is attained, the speedy abolition of international war between so-called civilized nations.» The original trustees selected by Mr. Carnegie were: United States Senator Elihu Root, representative of the United States at The Hague Tribunal; Nicholas Murray Butler, president of Columbia University; Henry S. Pritchett, president of the Carnegie Foundation for the Advancement of Teaching; Joseph H. Choate, former Ambassador to Great Britain; Albert K. Smiley, educator and humanitarian; Charles W. Eliot, president-emeritus of Harvard University; James Brown Scott, solicitor for the State Department; John W. Foster, ex-Secretary of State; Andrew J. Montague, ex-governor of Virginia; Congressman William M. Howard, Lexington, Ky.; Congressman James L. Slayden, San Antonio, Tex.; Judge Thomas Burke, Seattle, Wash.; Andrew D. White, ex-Ambassador to Germany; Robert S. Brookings, lawyer, Saint Louis, Mo.; Samuel Mather, banker, Cleveland, Ohio; J. G. Schmidlap, railroad man, Cincinnati, Ohio; Arthur W. Foster, regent of the University of California; Robert A. Franks, banker, Hoboken, N. J.; Charlemagne Tower, ex-Ambassador to Germany and Russia; Oscar S. Strauss, Ambassador to Turkey; Austen G. Fox, lawyer, New York; John Sharpe Williams, senator-elect from Mississippi; Charles L. Taylor, chairman of the Carnegie Hero Commission; John L. Cadwalader, lawyer, New York; George W. Perkins, financier, New York; Cleveland H. Dodge, philanthropist and financier; Luke E. Wright, ex-Secretary of War; Robert S. Woodward, president of the Carnegie Institution.

At their first meeting these 28 trustees accepted the fund by formal resolution, and appointed a committee on organization which at the next meeting, held in Washington on 9 March 1911, presented the following statement of the aims and purposes of the Endowment:

«That the objects of the corporation shall be to advance the cause of peace among nations, to hasten the abolition of international war, and to encourage and promote a peaceful settlement of international difficulties, and, in particular — (a) To promote a thorough and scientific investigation and study of the causes of war and of the practical methods to prevent and avoid it; (b) to aid in the development of International Law, and a general agreement on the rules thereof, and the acceptance of the same among nations; (c) to diffuse information, and to educate public opinion regarding the causes, nature, and effects of war, and the means for its prevention; (d) to establish a better understanding of international rights and duties, and a more perfect sense of international justice among the inhabitants of civilized countries; (e) to cultivate friendly feelings among the inhabitants of the different countries, and increase the knowledge and understanding of each other by the several nations; (f) to promote a general acceptance of peaceable methods in the settlement of international disputes; (g) to maintain, promote, and assist such establishments, organizations, associations, and agencies as shall be deemed necessary or useful in the accomplishment of the purposes of the corporation, or any of them.»

At this same meeting the following officers were elected: President, Elihu Root; vice-president, Joseph H. Choate; secretary, James Brown

Scott; treasurer, Walter M. Gilbert (temporary appointment).

At the same time the by-laws of the association were drawn up, and provision was made, *inter-alia,* for the establishment of an executive committee (consisting of the president, the secretary and five trustees), which at its first meeting, held likewise on 9 March 1911, decided to divide the work of the Endowment into three divisions: (1) *The Division of Intercourse and Education,* to promote the objects specified in sections (c), (e), (g); (2) *the Division of Economics and History,* to promote a scientific investigation and study of the causes of war and of the practical means to prevent and avoid it, as specified in section (a); (3) *the Division of International Law,* to promote the objects specified in sections (b), (d), (f). These three divisions may be described as popular, scientific and juristic, departments in which the work of the Endowment naturally falls. Thus the main activities of the Endowment were established on definite lines, and a world-wide co-operation in each branch of its work was planned. It was decided to inaugurate a series of conferences with foreign publicists, economists and statesmen, to be held in European cities, and a large number of eminent and influential men of all nationalities were invited to take a more or less active part in the propaganda.

While the outbreak of the European War in the summer of 1914 seriously interfered with the carrying-out of the program, that catastrophe only emphasized the incalculable importance and need of the work to which the Endowment is dedicated. War itself, indeed, is throwing light on the main problem, that of preventing war, and is bringing the solution of the problem nearer. On 20 April 1917, the trustees of the Endowment unanimously adopted a formal resolution, declaring their «belief that the most effectual means of promoting durable international peace is to prosecute the war against the Imperial German government to final victory for democracy, in accordance with the policy declared by the President of the United States.» On the same day, moreover, a sum of $500,000 was appropriated, by formal resolution, «for the reconstruction of devasted homes of Belgium, France, Serbia or Russia.» The main office of the Endowment is located in Washington, D. C., while a branch office is located in New York, where the directors of the divisions of intercourse and education and of economics and history have their desks; the director of the division of international law, who is also secretary of the Endowment, has his office at the Washington headquarters.

PAUL B. THOMAS.

CARNEGIE FOUNDATION. The Carnegie Foundation for the Advancement of Teaching had its inception on 16 April 1905, with a fund of $10,000,000. The act of incorporation was passed by Congress and approved by the President of the United States on 10 March 1906. The aim of this institution is the establishment of an agency to provide retiring allowances for teachers in colleges, universities and technical schools of the English-speaking countries of North America, and to serve the cause of higher education by advancing and dignifying the profession of the teacher in these higher institutions of learning. In order to be admitted to the retiring allowance system of the Foundation, the essential work of an institution must be that of higher education and of such a character that graduation from a four-year high school course, or equivalent training, constitutes a prerequisite therefor.

A technical school, to be eligible, must have entrance and graduation requirements equivalent to those of the college, and must offer courses in pure and applied science of equivalent grade.

Institutions which maintain a course or courses for which high-school graduation, or equivalent training, is not required for admission, must present to the Foundation the number of students and the names of the teachers in such course or courses; also, separately, the number of students of whom high-school training, or the equivalent, was required for admission, and the names of the teachers engaged exclusively in instructing the latter class of students.

No institution will be accepted which is so organized that stockholders may participate in its benefits.

Institutions of higher learning are recognized as eligible, under the following conditions:

1. Colleges, universities and technical schools of requisite academic grade, not owned or controlled by a religious organization, whose charters specifically provide that no denominational test shall be applied to trustees, officers, teachers or students.

2. In the case of colleges, universities and technical schools, not owned or controlled by a religious organization, the trustees of such institutions are asked to certify that, notwithstanding the lack of specific prohibition in the charter, «no denominational test will be imposed in the choice of trustees, officers or teachers, nor in the admission of students, nor will denominational tenets or doctrines be taught to the students.» Upon the passage of such resolution by the governing bodies of such institutions, they may be recognized as entitled to the benefits of the Foundation, so far as considerations of sectarian control are concerned.

An institution not supported by taxation must have a productive endowment of not less than $200,000 over and above any indebtedness of the institution.

A tax-supported institution must be in receipt of an annual income of not less than $100,000.

Retiring allowances are granted in the colleges, universities and technical schools on the accepted list of the Foundation on two distinct grounds: (1) To a teacher of specified service on reaching the age of 65; (2) to a teacher after 25 or 30 years of service in case of physical disability. To these two main divisions the trustees have added many extra conditions.

At the instigation of the Carnegie Foundation, a plan for an exchange of teachers between the United States and Prussia was put into effect in 1908. This plan has been in active operation ever since. During the year 1910 a sensation was created in educational circles through the rejection by the Foundation of several western colleges which did not, in the opinion of the trustees, come up to the requirements set by Mr. Andrew Carnegie in his deed of trust. In the same year, Mr. Morris Llewellyn Cooke, a member of the American Society of Mechanical Engineers, undertook at the instigation of the Carnegie Foundation a detailed study of some of the American institutions of learning, with a view to ascertaining whether they were being conducted in a proper manner and whether or not the large sums of money being expended by all of them were put to the best and most practical uses. In the course of his investigation Mr. Cooke examined at length the departments of physics at the universities of Harvard, Columbia, Toronto, Wisconsin and Princeton, at Haverford and Williams colleges, and at the Massachusetts Institute of Technology. His opinion was considered of great importance, it being the first time that a practical business man had officially applied the principles of practical business to the system of education in the United States. His verdict was that there was a very decided waste apparent at all of the institutions he visited. In his report he allowed facts to speak for themselves for the most part and rarely uttered any direct criticism, although he did take occasion to score the life tenure of professorships where they occurred, the committee system of management and the stress laid on the importance of research work. Mr. Cooke declared that he found researches being pursued in some of the colleges for which no possible excuse was offered, except by the man who happened to be conducting them, and he believed that altogether too much attention was uniformly paid to this branch of collegiate work.

Owing to the requirements already mentioned for admission to the benefits of the Foundation Fund, the list is somewhat limited of institutions which can apply for pensions. In welcoming eligible institutions to this limited list, the Foundation has sought to distribute them not only geographically, but among colleges of different types. In 1915, 73 institutions shared in the pension fund. Twenty were small colleges of the type of Middlebury College in Vermont and Franklin College in Indiana. Twenty-five were strong colleges like Williams College in Massachusetts and Colorado College in Colorado. The remaining 28 were about equally distributed between universities like Lehigh University in Pennsylvania and Tulane University in Louisiana, and a similar group of the strongest universities in the country, whether privately endowed like Harvard in the East or State-supported like the University of California in the West. According to the ninth annual report for the fiscal year 1914–15, the income received from the general endowment of the Foundation was $696,038.60; from the endowment of the division of educational inquiry, now kept as a separate budget item, $50,358.34. The total expenditures under the general endowment were $669,532.99, of which $510,750.97 went to pay the retiring allowances and pensions in institutions on the accepted list of the Foundation, and $124,112.80 to allowances and pensions to individual officers, teachers and widows in institutions outside of this list. Forty-four allowances were granted during the fiscal year, involving an expenditure of $70,900. The number of deaths during the year was 15, making a net increase of 29 to the number of allowances and pensions in force, which at the end of the year were 432, with a total grant of $687,370 The grants made during the year represented in all 32 institutions. The trustees held in trust at the close of the fiscal year under the general endowment securities of the face value of $14,129,000; under the division of educational inquiry $1,250,000. The Foundation and its work have received considerable adverse criticism and opposition. "The spectre of a baneful educational influence" writes President Henry S. Pritchett, "exercised by a remote agency upon the policy of struggling colleges and universities is one that has been successfully invoked in some quarters. The apprehension that college professors could be influenced in their attitude by the pensions they are to receive rests upon two misconceptions; the first, as to the methods of administration. The teacher in the associated colleges does not deal with the Foundation at all. He deals entirely with his college and receives his pension from the college exactly as he receives his salary. The other misapprehension rests upon a misconception of the character of the American college professor. The university teacher in America has a fairly stiff backbone. Nothing would so arouse his opposition as any effort, however indirect, to control his opinions about education, college administration or any other subject. The sole opportunity the Foundation has to influence the educational judgment of professors is through its publications, and these have weight only as they are sound and prove in the end to be wise."

CARNEGIE HERO FUND. During 1904, through the munificence of Mr. Carnegie, a fund called the Carnegie Hero Fund was created for adequately rewarding such persons as should perform deeds of heroism which would otherwise receive no appreciation beyond a possible paragraph in a daily newspaper. Mr. Carnegie endowed the Fund with $5,000,000, the expenditure of which was to be directed by a commission of his own naming, of which Mr. Charles L. Taylor was appointed president. In his deed of trust to the commission Mr. Carnegie expressed himself as having long felt that heroes and those dependent upon them should be freed from pecuniary cares resulting from their heroism. In establishing the Fund it was his purpose to place in a somewhat better pecuniary position than before those following peaceful vocations who have been injured in heroic efforts to save human life, and, in case of their death, to provide for the widows and children as long as that should be necessary and advisable. He made the stipulation, however, that no grant was to be continued unless it were soberly and properly used and unless the recipients remained sober, respectable, well-behaved members of the community. In all cases a medal of gold, silver or bronze, according to which the deed in question was believed by the commission to call for, was to accompany each grant, and, in cases where no monetary aid was called for, an appropriate medal was in any event to be awarded, setting forth the heroic deed it commemorated. Subsequent resolutions and by-laws passed by the commission govern the operative work of the Fund, but the broad, general lines of its scope remain those which Mr. Carnegie recited. It has been widely praised for its work on all sides, and has been an incalculably powerful factor in relieving people in want whose real worth was fully revealed for the first time perhaps through their deeds of unselfish heroism.

The field embraced is the United States, the Dominion of Canada, the colony of Newfoundland and the waters thereof.

Such acts must have been performed on or after 15 April 1904 and brought to the attention of the commission by letter addressed to the manager, Oliver Building, Pittsburgh, Pa., within three years of the date of the act. Up to 1915 the commission had awarded 723 bronze, 387 silver and 18 gold medals; $1,249,656 had been awarded for disablement benefits and for educational and other specific purposes, and for the dependents of heroes who lost their lives. Pensions in force on 31 Dec. 1915 amounted to $79,200 annually. The commission had also awarded $169,462 for the relief of sufferers from disasters; Brockton, Mass., $10,000; California earthquake, $54,462; Monongah Mines, W. Va., $35,000; Darr Mine, Pa., $25,000; Lick Branch Mine, W. Va., $10,000; McCurtain Mine, Okla., $15,000; Jed Mine, W. Va., $10,000; and for the relief of Ohio and Indiana flood sufferers, $10,000.

CARNEGIE INSTITUTION OF WASHINGTON. This institution was founded by Andrew Carnegie on 28 Jan. 1902, with an endowment of $10,000,000 of registered 5 per cent bonds; to this fund he added $2,000,000 on 10 Dec. 1907, and $10,000,000 on 19 Jan. 1911. The Institution was originally organized under the laws of the District of Columbia and incorporated as the Carnegie Institution, but was reincorporated by an act of the Congress of the United States, approved 28 April 1904, under the title of The Carnegie Institution of Washington. The articles of incorporation of the Institution declare in general "that the objects of the corporation shall be to encourage in the broadest and most liberal manner investigation, research and discovery, and the application of knowledge to the improvement of mankind." Three principal agencies to forward these objects have been developed. The first of these involves the formation of departments of research within the Institution itself, to attack larger problems requiring the collaboration of several investigators, special equipment and continuous effort. Eleven such departments have so far been established. The second provides means whereby individuals may undertake and carry to completion investigations not less important but requiring less collaboration and less special equipment. The third agency aims to provide adequate publication of the results of research coming from the first two agencies and to a limited extent also for worthy works not likely to be published under other auspices. The Institution is placed under the control of a board of 24 trustees, which meets annually in December to consider the affairs of the Institution in general, the progress of work already undertaken, the initiation of new projects and to make necessary appropriations for the ensuing year. During the intervals between the meetings of the trustees the affairs of the Institution are conducted by an executive commission chosen by and from the board of trustees and acting through the president of the Institution as chief executive officer. A view of the history of the Institution may be gained from the contents of the 'Year Books' and from its other more formal publications, general and classified lists of which may be had on application. The publications themselves, numbering over 300, may be found in nearly all the greater libraries of the world. The executive offices of the Institution are in its Administration Building, 16th and P streets, northwest, Washington, D. C.

CARNEGIE TECHNICAL SCHOOLS, Pittsburgh, Pa., a co-educational institution founded by Mr. Andrew Carnegie with an endowment of $4,000,000. The schools are housed in five buildings. The United States Geological Survey has established in Machinery Hall the main laboratory of the Chemical Division, Technologic Branch, where investigations of fuels from all parts of the country are conducted. The courses in the schools are arranged for day and night students. There are four departments: 1. The School of Applied Science, offering preliminary and specialized courses in the fields of engineering and chemical practice. The time for completion of the course depends on the aptitude and application of the individual students; (2) the School for Apprentices and Journeymen, which gives general training to supplement the usual apprenticeships in order to counteract the dangers of specialization and over-emphasis of the practical as opposed to the theoretical sides. Courses as given during slack seasons, etc.; (3) the School of Applied Design, offering courses in architecture and interior decoration. The standards for admission are high school or equivalent certificate and an entrance examination; (4) the Margaret Morrison Carnegie School for Women, giving training in the home-making arts, dress-making and design and secretarial work. Candidates are admitted on personal interview if they are over 18, and by examination if they are under 18.

CARNEGIE YACHT. The *Carnegie* is one of those little known developments which prove, first, how far from perfection the science of to-day is, and, on the other hand, how far it has advanced even within a quarter of a century. The peculiarity of this yacht is that it is non-magnetic; in other words, the only magnetic steel on board her is the compass.

The compass does not, as common thought conceives, point directly to the pole. It is deflected by the variations in the magnetic influence of the earth, by the presence of large masses of iron on board ship and by the neighborhood of certain mountains and islands of volcanic origin. Along the inner passage from Seattle to Alaska the attraction from shore affects a ship's compasses a mile away. Navigation to-day involves the possession of correct information as to these variations of magnetic attraction. This information the *Carnegie* is engaged in securing.

The yacht is neither owned nor controlled by the man for whom she is named. She was built from the funds of the Carnegie Institution of Washington, founded by Andrew Carnegie, and was launched on 12 June 1909. In six weeks, with the appliances on board, a single cruise enabled her officers to discover systematic errors of importance in the best charts now available. For 10 years the existence of these errors had been more or less suspected, and thousands of observations had been taken by skilful and experienced navigators without definite results. The information gained by the *Carnegie* is accepted as correct by the leading hydrographic offices of the world.

The best that the commanders of iron vessels have been able to do, hitherto, has been to entrust the examination of their compasses to a professional adjuster, who, when his work is completed, furnished what is called a deviation card showing the corrections or errors of the compass on the various headings of the ship. The investigations of the *Carnegie* will enable the steamer captain to check up these adjustments with full knowledge of the correct or undisturbed variation, or direction of the compass, in all waters he is likely to traverse. Hitherto the captain's only means for this "checking up" was by personal astronomical observations when the state of the weather permitted. From the aid of the *Carnegie,* he will soon be able to know exactly how the compass would point were it mounted on a non-magnetic vessel. Comparing this with his compass as adjusted, he has the satisfaction and security of being able to make his calculations on a mathematical certainty.

The ingenuity of the *Carnegie's* construction merits the attention of even the casual reader. Her dimensions are: Length over all, 155½ feet; length on load water-line, 128⅓ feet; beam, molded, 33 feet; mean draft, 12 feet 7 inches; displacement, 568 tons; registered tonnage, 246. The materials used were mainly white oak, yellow pine, Oregon pine, and teak. The fastenings are locust treenails, copper and Tobin bronze bolts and composition spikes. The anchors — four in number — are of manganese bronze with a total weight of 5,500 pounds.

There are no anchor chains; instead, three 11-inch hemp cables are used. She is of brigantine rig, with 12,900 square feet of plain sail; riggings, special Russian hemp; metal work on spars, rigging and blocks, of bronze and gunmetal. The auxiliary power consists of one 150 indicated horse-power producer gas engine, built practically of non-magnetic metals, such as bronze, copper and non-magnetic manganese steel. There are two non-magnetic 20-foot whale-boats and one 16-foot gig. The cooking ranges and refrigerating plant are of bronze or copper. The cutlery is Mexican silver. The *Carnegie* is the first sea-going vessel equipped with a producer gas engine. In calm weather a day's run can be made with auxiliary power alone, of 144 nautical miles, at a cost of $7 for coal consumed. The scientific staff consists of 7 men, and the crew of 14.

Before the building of this unique little vessel (described as a yacht for convenience in entering port, and making arrangements with customs, etc.), the magnetic observers of the Carnegie Institution had sent its brigantine, the *Galilee,* on cruises amounting in the aggregate to 60,000 miles. Its magnetic observers had penetrated to nearly every part of the earth, and have been, and still are, co-operating with various polar expeditions, securing magnetic data in those regions. The result is a set of magnetic charts for the greater part of the earth at least, the first which can be said to be based upon uniformly and systematically acquired data. The good will and co-operation of every civilized country have been manifested in this great work.

The usefulness of the *Carnegie,* and of the various forms of work akin to that which she has done, has practically no limitations for the simple reason that not only has the magnetic state of our globe been hitherto unascertained with certainty, but it is constantly changing. This became known as early as 1634, when Henry Gellibrand noted that since 1584 the easterly direction of the compass had changed by seven degrees. Obviously, this affects more or less every survey that is made. Hence the work of the Carnegie Institution extends not only over the sea but also on land. The work by sea is, however, of far greater significance from the point of view of the security of human life, since a variation of a minute fraction in the compass may result — as has been the case once or twice — in the wrecking of a liner on rocks supposed to have been correctly charted. On 8 June 1914, after refitting at New York the *Carnegie* left for an expedition in the North Atlantic. After visiting Norway, Spitzbergen in the latitude of 79° 52', and Iceland, and covering 10,600 miles, she returned to her base station at Greenport, Long Island, 9 Oct. 1914. She refitted at Brooklyn for a longer cruise during 1915–16, in southern latitudes (50° to 75°), where magnetic observations required supplementing.

CARNEIA, national festival of the ancient Spartans celebrated in honor of Apollo, and in the Spartan month Carnejos. The festival lasted nine days, during which the Spartans were not allowed to enter on a hostile campaign. It was originally a herdsman's festival, but at Sparta had assumed a military character. The men bivouacked in booths, in nine divisions, and all the exercises were governed by the commands of the herald. There were musical contests, and a singular foot race, in which one man was pursued by a number of others. If he was caught, it was a sign of good luck; his escape foreboded evil.

CARNEIRO, kär-nā'rō, **Joaquim da Silva,** Portuguese engraver and writer: b. Oporto in 1727; d. Lisbon 1818. When 12 years of age removed to Brazil, where he lived 17 years. As he began early to display his artistic talents, he was placed under the tuition of Joao Gomez, the celebrated engraver, at Rio de Janeiro. In 1756 he returned to Europe to complete his studies where, in 1769, he became the head of the royal engraving school at Lisbon, and later was made teacher of design in the royal college. He studied art for a time in Rome and did some of his best work there. He was also a prolific writer and translator of technical books relating to the engravers' art, and author of a great number of engravings of high merit for which he is chiefly remembered, especially for 'The Child Jesus carried by Saint Joseph,' and the even more celebrated picture, 'The Annunciation of the Virgin Mary.'

CARNELIAN. See CORNELIAN.

CARNIFEX FERRY, W. Va., place at which occurred a battle of the Civil War, 10 Sept. 1861. On 23 August Gen. John B.

Floyd, who had marched from Lewisburg, crossed to the north side of Gauley River at Carnifex Ferry with five regiments of Virginia infantry, 100 cavalry, and five guns, aggregating about 2,600 men. The 7th Ohio had been guarding the ferry, but had been recalled to within six miles of Gauley Bridge, and then ordered to return to Cross Lanes, two miles from Floyd's position, which it reached in the night of the 25th. Early on the morning of the 26th Floyd advanced, surprised the regiment while at breakfast, and routed it, killing and wounding 45 and capturing 96. About 200 men escaped to Gauley Bridge and about 400 were collected and led by Major Casement to Charleston on the Kanawha. Floyd's intention in crossing the Gauley was to force the retreat of Gen. J. D. Cox from Gauley Bridge down the Kanawha Valley, whither he proposed to follow him and make a raid of 50 miles into Ohio, but Gen. H. A. Wise, who commanded one of his two brigades, had refused to obey his order to cross the Gauley, upon which Floyd abandoned his idea of invading Ohio, and intrenched his position in a bend of the Gauley, both flanks resting on the precipices rising abruptly from the river. The presence of Floyd north of the Gauley gave General Rosecrans some uneasiness, and turned his attention from the Cheat Mountain region where he had been confronting Gen. R. E. Lee. Leaving Gen. J. J. Reynolds to oppose Lee, he drew troops from posts in the rear and assembled at Bulltown seven and a half regiments of Ohio infantry, two batteries of artillery and three companies of cavalry, which were formed into three brigades, commanded by Gen. H. W. Benham and Cols. E. P. Scammon and R. L. McCook. On 9 September he marched from Bulltown, crossed Big Birch Mountain, drove the 36th Virginia and a company of cavalry from Summersville, on the morning of the 10th, and followed to Cross Lanes, which he reached at 2 P.M., and heard that Floyd was intrenched about two miles distant. Benham, commanding the leading brigade, was ordered to advance cautiously and feel Floyd closely, but not to engage him until the entire column came up, unless he saw a good opening. Benham drove in Floyd's pickets, and believing that he was in full retreat, pushed rashly forward in the face of a severe artillery fire, becoming closely engaged and making some spirited charges upon Floyd's works, which were repulsed. He then called for help. Rosecrans hastened up the brigades of Scammon and McCook, and going to the front, was surprised that the reconnaissance ordered had developed into a severe and badly conducted engagement. It was too late to withdraw without giving the appearance of defeat; other efforts were made, in which Scammon and McCook participated; but it was growing dark, the men were exhausted after their march of 17 miles, and Rosecrans withdrew, intending to renew the fight in the morning. During the night Floyd recrossed the Gauley, destroyed the foot-bridge behind him, sunk the ferry-boat and, with Wise, retreated to Sewell Mountain. The Union troops, fully exposed and not well handled, had 17 killed and 141 wounded. The Confederates, well protected by log-works, had none killed and 21 wounded. Consult 'Official Records' (Vol. V) and 'Battles and Leaders of the Civil War' (Vol. I, New York 1887, ed. by Johnson and Buel).

E. A. Carman.

CARNIOLA (German, Krain), Austria, a province with an area of 3,856 English square miles. It is bounded by Carinthia on the north, Styria on the northeast, Croatia on the east, southeast and south, and Istria and Görz on the west. It is covered with lofty mountains, some of which are about 10,000 feet high, and, generally speaking, is one of the most unfertile regions of the empire. Some districts, however, produce considerable quantities of wheat, barley, wine and, in the south, fruits of various kinds and excellent flax. There are some iron, lead and quicksilver mines, the latter exceedingly rich. It abounds in clays and valuable stones, and in coal and marble. There are considerable manufactures of iron, fine linen, lace, woolen cloth, flannel, worsted stockings, leather, wooden articles, etc. Its chief exports are steelwares, quicksilver, hats, linens, glasswares, wax, wine, lignite, flour, etc.; principal imports — salt, oil, fruit, coffee, sugar, tobacco, cloths, cattle, etc. Nearly 300 miles of railway lines, with Laibach, the capital, as the centre, facilitate the commerce of the crownland. There are about 380 elementary schools, attended by over 75,000 children. Carniola is represented in the Lower House of the monarchy by 11 delegates, of whom two are drawn from the landed aristocracy, three from the towns, five from the rural communities, and one elected by the people at large. Its own Diet consists of 36 members drawn from the same classes and in about the same proportion. Nearly 94 per cent of the people are Slovenes, and the remainder consists of Germans, Serbo-Croatians and Italians. Almost the entire population belongs to the Roman Catholic Church. Carniola was made a duchy in the 12th century, under the dominion of the counts of Tyrol, who became extinct in 1335, and were succeeded by the earls of Görz. After the Treaty of Vienna, in 1809, it was ceded to France, and incorporated in the kingdom of Illyria. In 1814 it came again into the possession of Austria. Capital, Laibach with a population of 36,547. Pop. 525,083.

CARNIVAL. The same views which led men to propitiate the higher invisible powers by gifts, sacrifices and purifications, also introduced fasts, abstinence from pleasure, and penances. By fast is meant an abstinence from the usual means of nourishment, in order to mortify the appetites, and thereby to propitiate the Deity. In every nation of importance customs of this kind are found. Their historical origin is in the religious customs of the East, where the priests were originally the physicians of the people, and prescribed these fasts as a part of the regimen necessary in this warm region, as well as from religious views. Fasts are observed to this day in the East. The religions of the Persians and the Hindus, those of the Mohammedans, and of the worshippers of the Lama, insist much on fasts. Few traces of them are found in the religion of the ancient people of the North. The earliest Christians fasted on the vigils (q.v.). The fasts on the *jejunia quattuor temporum*, which continued for three days every quarter of the year, were penances, as was that of the period of 40 days (before Easter, or rather before Good Friday,

CARNIVOROUS

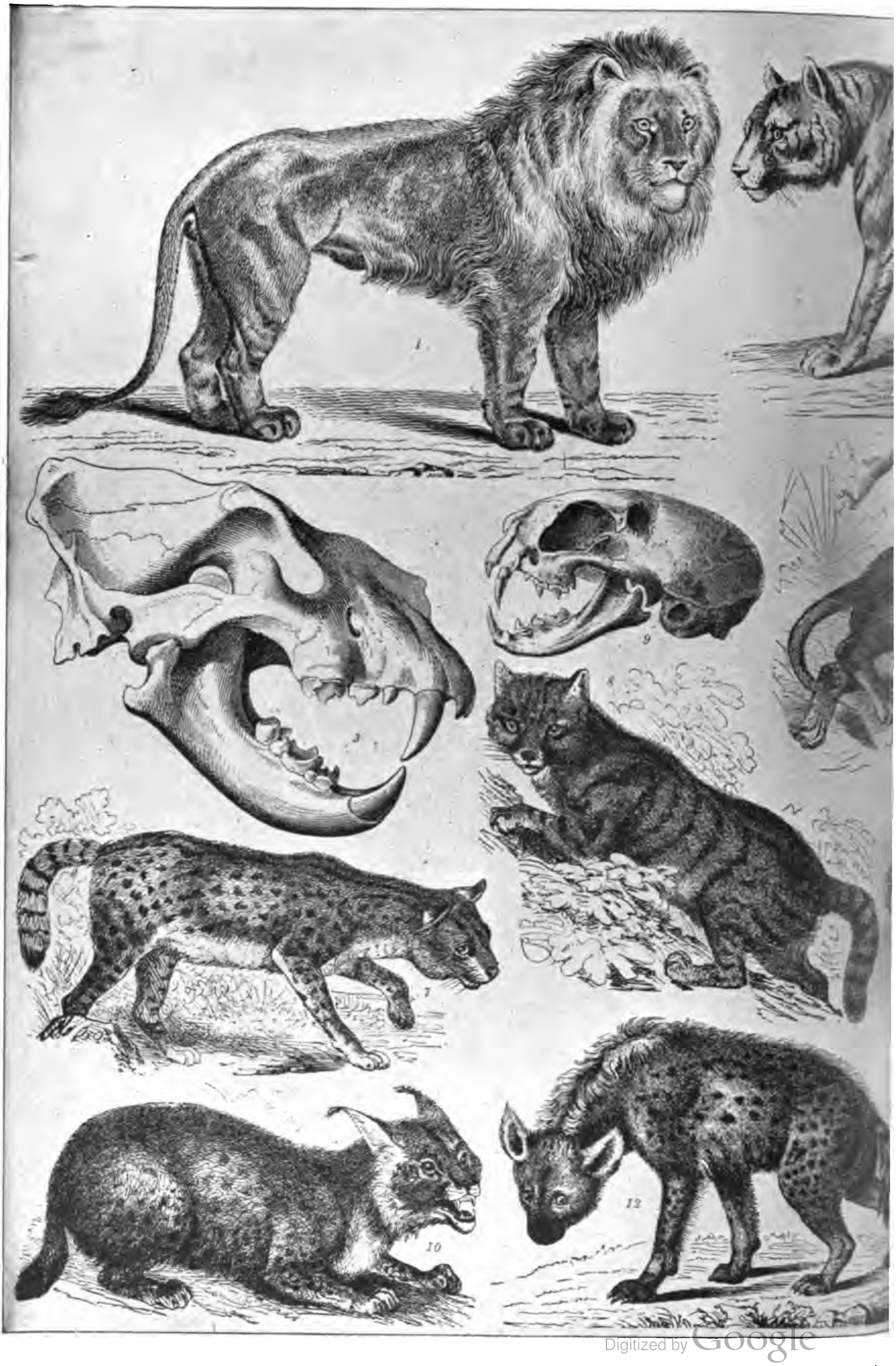
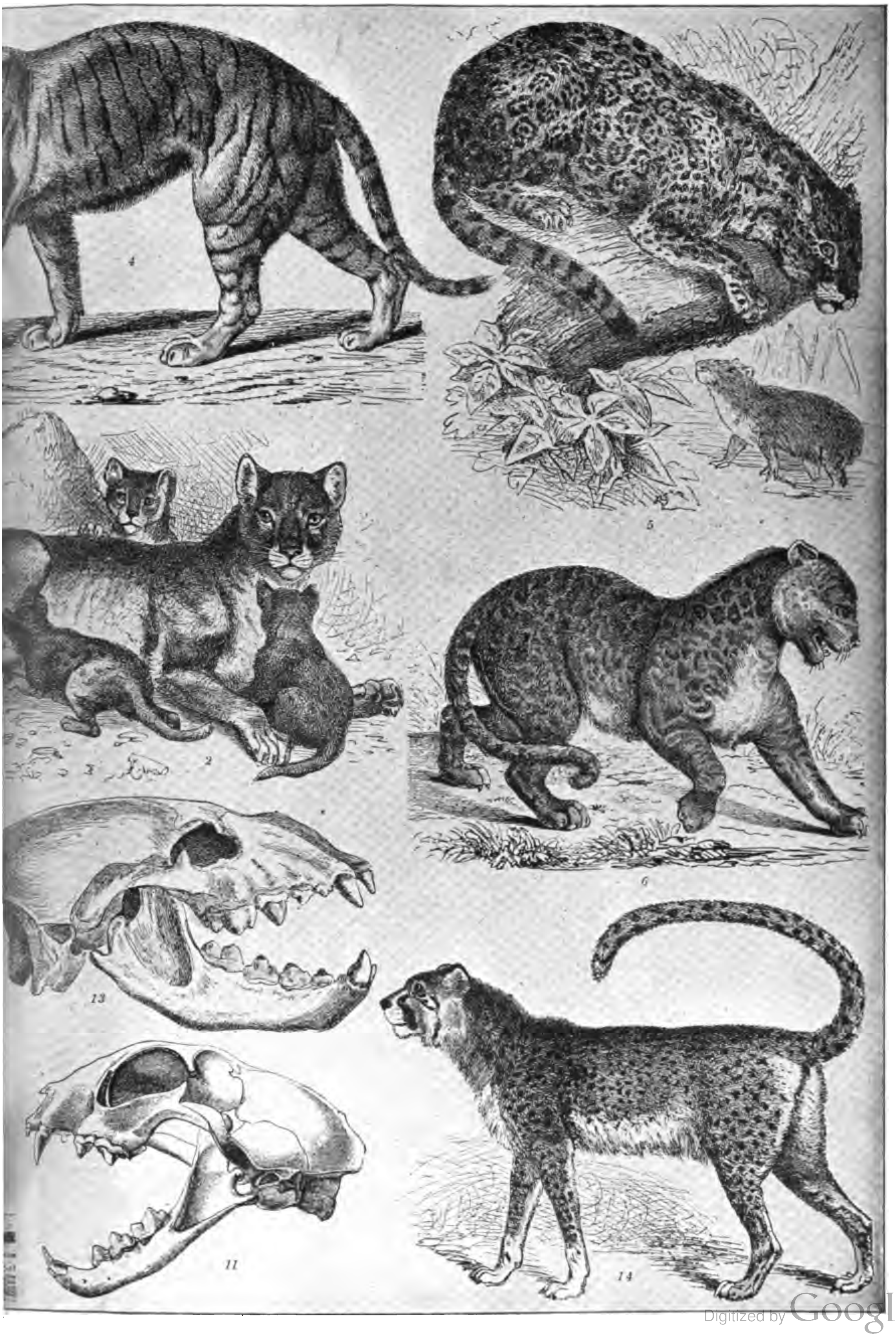


Fig. 1 Lion 2 Lioness 3 Skull of Lion 4 Tiger 5 Jaguar 6 Leopard 7 Serval 8 Wild cat



9 Skull of the Cat **10** Lynx **11** Skull of Lynx **12** Spotted Hyæna **13** Skull of Hyæna **14** Chetah

Quadrigesima), which was called, by way of excellence, the fast, and which commemorated the 40 days' fast of Jesus in the wilderness. With regard to the origin of Christian fasts, opinions differ. The most common is, that Telesphorus, bishop of Rome, in the middle of the 2d century, first instituted the 40 days' fast as a rule of the Church. By Pope Gregory the Great, about 600, Ash Wednesday was made the beginning of the fast, and the day before was called fast eve, because in the night of this day, at 12 o'clock, the fast began. This fast was preceded by a feast of three days, very obnoxious to the strict zealots. "Christians," it is said, "on these days deliver themselves up to voluntary madness, put on masks, exchange sexes, clothe themselves like spectres, give themselves up to Bacchus and Venus and consider all pleasure allowable." This is the origin of the present carnival, or *Fasching*, as it is called in the south of Germany, and which continues in that country from Twelfth Day to Ash Wednesday. The name carnival is derived from the Latin *caro, carnis*, flesh, and *vale*, farewell (according to Ducange, from the Latin denomination of the feasts in the Middle Ages, *carnis levamen*, solace of the flesh), because at that time people took leave of flesh. Previously to the commencement of their long abstinence, men devoted themselves to enjoyment, particularly during the last three days of the carnival. The carnival is nothing but the Lupercalia of the Christian Romans, who could not forget their pagan festivals. At least it greatly resembles the Saturnalia which were celebrated annually in December, with all kinds of mirth, pleasure and freedom, in honor of Saturn, and the golden age when he governed the world, and to preserve the remembrance of the liberty and equality of man in the youth of the world. In Rome, the carnival brought to view, in a lively manner, the old Saturnalia in a new form. During the last days of the carnival, and particularly during the day which preceded the long fast, mummeries, plays, tricks and freedom of every kind abounded. From Italy, the modern Saturnalia passed to the other Christian countries of Europe. The wealthiest class commenced their amusements 8 or 10 days before Ash Wednesday, the middle classes two or three days, the poor only observed one day (the *Fastnacht* of the Germans). In the amusements of this period the dramatic poetry of Germany had its origin, after the cities had attained a flourishing condition. Its first traces appeared in the 13th century. The mummeries of the carnival produced the idea of adopting some character, and carrying it through. To please the multitude, and make the laugh more certain, the manners of common life were caricatured. There exhibitions afterward became more cultivated and developed. On fast eve persons in disguise sometimes went from one house to another, to make sport with their friends and acquaintances. A merry society of this kind formed a plan to represent some scene in their disguises, and hold a regular conversation at one of these mummeries. The unknown players received praises, entertainments or presents. Encouraged by this success, the company grew stronger, their fables and speeches became longer by degrees, until they attained to regular representations of human life. It was in Nüremberg, renowned for its wares and its wit, that the first fast eve's play was produced, coarse and frolicsome, to suit the taste of the citizens. The earliest of these pieces that have come down to us date from 1450–70; they have a near relationship to the masques of the English and the farces of the French, as have the spiritual fast eve's plays, religious burlesques, to the Mysteries and Moralities. In Italy the carnival is now celebrated with the greatest show and spirit at Rome. It lasts for the 10 days preceding Ash Wednesday, certain observances taking place on certain days. Some days, for instance, are devoted to the throwing of comfits, or of small plaster pellets that take their place, these being flung from the balconies of the houses upon the persons in the streets — especially in the Corso — who retaliate in the same way, and in order that they may do this many of them are mounted upon lofty cars or other vehicles, all being masked. On other days the finest equipages move along in procession, and flowers instead of comfits are thrown. Races of riderless horses in the Corso are another prominent feature of carnival time. After sunset on Shrove Tuesday everybody carries a lighted taper (these being known as *moccoletti*), and each tries to extinguish as many others as he can while keeping his own alight. Venice, Turin, Milan, Naples, Florence, etc., also celebrate the carnival with more or less ceremony, and the same can be said of various towns of the south of France, Nice in particular. The carnival at Rome has been excellently described by Goethe. In Germany the carnival is celebrated with brilliancy only in the Catholic cities of the Rhine Valley, Mayence, Bonn, but above all Cologne. In Protestant countries, generally, the feast is not observed to any extent. In the United States the principal observance of this nature is that held annually at New Orleans. Various civic organizations take part in a great street pageant, in which are elaborate tableaux, brilliantly illuminated and placed on vehicles. Historic, poetic and other scenes are artistically portrayed often at great expense. In Paris a fat ox (*bœuf gras*) was led in the procession, followed by a child in a triumphal car, who is named "king of the butchers." From this taking place on the Tuesday (Mardi) preceding Ash Wednesday the festival came to be known under the title Mardi Gras, which name is now generally applied to such festivals in America and elsewhere. See PAGEANT.

CARNIVORA, broadly, those animals which prey upon other animals; but in a restricted sense, that order of mammals more or less adapted for predatory life and including most animals popularly called beasts of prey. To this order the cat, dog, bear and seal belong. The head is small in proportion to the bulk of the body, and the skin is well covered with hair. The limbs, four in number, are fully developed, and are adapted either for walking or swimming. Two sets of teeth, deciduous or milk and permanent, are always developed in succession, and in both sets incisors, canines and molars, are distinguishable. The order is divided into two groups, the *Fissipedia*, which include such animals as the lion, wolf, bear, etc., whose life is terrestrial; and the *Pinnipedia*, or those which are specially adapted for aquatic life. The Carnivora are found in all parts of the world except Australia and New Zealand, where flesh-eating marsupials prevail. The ermine is probably the smallest specimen of this order, being but a few inches in length. The largest is the bear, some of the latter weighing as much as a ton. The carnivores serve as a check on the too rapid multiplication of herbivores, rodents, etc. From this class man has derived two valued pets — the dog and the cat. With the other genera of the order his relations are those of constant warfare. Some genera he hunts for their fur or flesh, others for sport, others he kills to protect his domestic animals. In civilized areas, consequently, the larger carnivores disappear entirely or to a great extent, and the result is the increase of various pests, as rats, mice, etc. In lands less civilized the larger carnivora hold their own even against man, tigers, lions and leopards killing thousands of human beings annually.

1. **Fissipedia.**— All the carnivores of this division, except the sea-otter (*Enhydra*), have six incisor teeth in each jaw, the canine teeth are prominent, and one of the molar series in each jaw is usually compressed laterally, so as to present a cutting edge. The toes are furnished with claws, and the anterior limbs are used for seizing and holding prey as well as for walking. The skull is contracted behind the orbits, so as to give an hour-glass form when seen from above. The hollow formed by this constriction on each side of the head is bridged over by the wide zygomatic arch, and thus gives room for the powerful muscles of mastication. The lower jaw is articulated to the skull, so that it can only be moved up and down. The incisor and canine teeth are represented by the formula $i\frac{3-3}{3-3}$, $c\frac{1-1}{1-1}$. The teeth behind the canines increase in size from before backwards, and vary from $\frac{4-4}{3-3}$ in the cat, to $\frac{8-8}{8-8}$ in the South African otocyon, the total number of teeth of all kinds ranging from 30 to 48. The posterior teeth are divided into premolars and molars; the last of the premolar series in the upper and the first of the molar series in the lower jaw presenting the lateral compression and trenchant margin which earns for them the name of sectorial or carnassial teeth. Behind the carnassial teeth the molars have tuberculated crowns. The stomach is simple and undivided, and, as a general rule, is more rounded in the flesh-eating genera. The limbs terminate in digits, which are never fewer than four, and are furnished with sharp claws, which in the *Felidæ* are retractile within sheaths of the integument on the dorsal surface of the toes. In walking, the extremities of the toes are applied to the ground, as in the «digitigrade» cat and dog; or the whole sole of the foot is put down, as in the «plantigrade» bear. The six families included under the fissipede carnivores are: (1) *Felidæ:* lion, tiger, leopard, cat, etc. These present the highest type of the carnivorous structure. The claws are retractile. (2) *Canidæ:* wolf, dog, jackal, fox, etc. The claws are not retractile, and the gape is longer. The toes in this and the previous family are five on the anterior and four on the posterior extremities. (3) *Hyenidæ:* myæna, aardwolf, etc. The hyenas have the anterior limbs longer than the posterior, and both terminate in four toes. The skull and dentition approximate to those of the Felidæ. (4) *Viverridæ:* The supple elongated bodies of these animals are intermediate between those of the cats and the martens. Some, as the civet, gennet, zibet, have the claws retractile; in others, as the ichneumon and rasse, they are not retractile. Those mentioned are digitigrade, but the suricate of Central Africa is plantigrade. In this family glands are found under the tail, the secretions of which have powerful odors. The diet of this family is not purely animal. (5) *Mustelidæ:* The members of this family have elongated bodies with short limbs, terminating usually in five-toed feet with retractile or non-retractile claws. The marten, weasel, polecat, glutton or wolverene, constitute one sub-family of exclusively terrestrial life. The badgers, the skunks and the like constitute another division. (6) *Ursidæ:* In this family the carnassial tooth is no longer trenchant, but tuberculated. All are plantigrade, but the habits and aspect vary considerably, and include, besides the bears, the raccoons, panda and several lesser forms. The raccoon and its allies are sometimes made a family with the name *Procyonidæ*. See MAMMALIA; BEAR; CAT; DOG, etc.

2. **Pinnipedia.**— The aquatic carnivores comprise three families, represented by the walrus or sea-horse, the eared seals and the common seals. They are related to the preceding families through the otters and the bears, and agree in having the extremities modified into swimming organs or flippers, and the teeth more uniform in character. See SEALS; WALRUS.

CARNIVORA, Fossil. A few remains of animals regarded as belonging to the *Carnivora* have been found in rocks of Eocene Age, but they are extremely generalized forms, and have a doubtful, if any, connection with the earlier creodonts (see CREODONTA). The Miocene rocks have yielded more, but still of very generalized or «synthetic» types, suggesting the ancestry of the dogs and civets; one is the European fossil genus *Cynodictis,* called a «viverrine dog,» because it combines rudely characteristics of the fox and civet. «This,» says Ernest Ingersoll (‹Life of Mammals› New York 1909), «shades off into the many species of *Galecynus,* and of *Amphicyon,* plantigrade animals existing in all parts of the Miocene world, and varying in size from that of a small fox to that of a long-bodied bear,— a huge combination of wolf, mungoos, and bear! Others of the same or a later time are more nearly typical civets, or stand between such and the linsangs, or connect civets and weasels; while at the beginning of the next, or Pliocene, period, there appears a curious animal, the ictithere, which completely unites the civets with the hyenas. *Amphicyon* was plantigrade and had other bearlike characteristics. Besides it, as we know from Miocene fossils, lived another animal (*Hemicyon*), which was more dog than civet, plus bearlike features; and later we find *Hyenarctos* still more ursine, so that these represent a line of change from bearlike dogs into doglike bears, and connect the *Amphicyon* stock with the true bears and raccoons. In a similar way fossil forms of the Upper Eocene

CARNIVOROUS

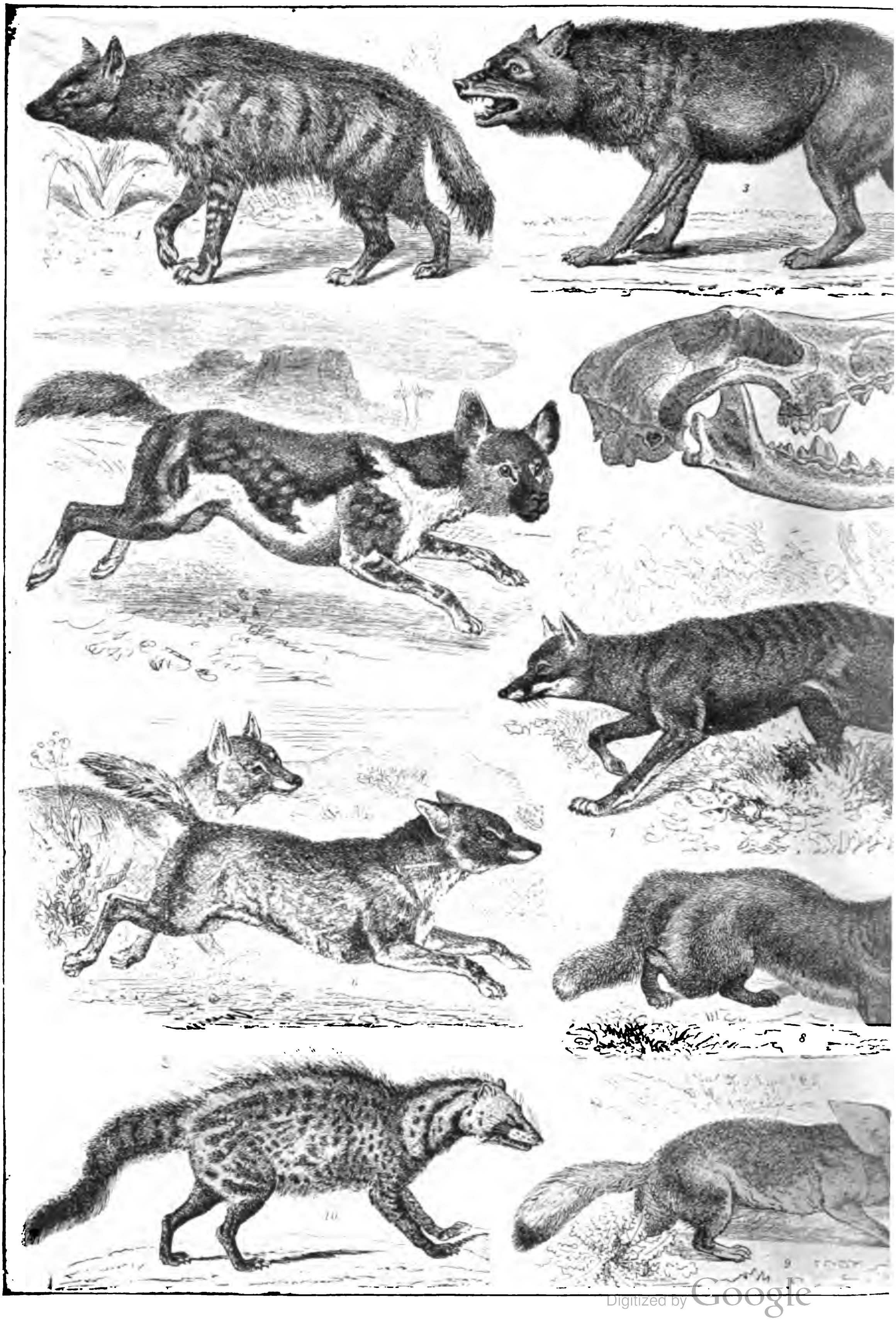
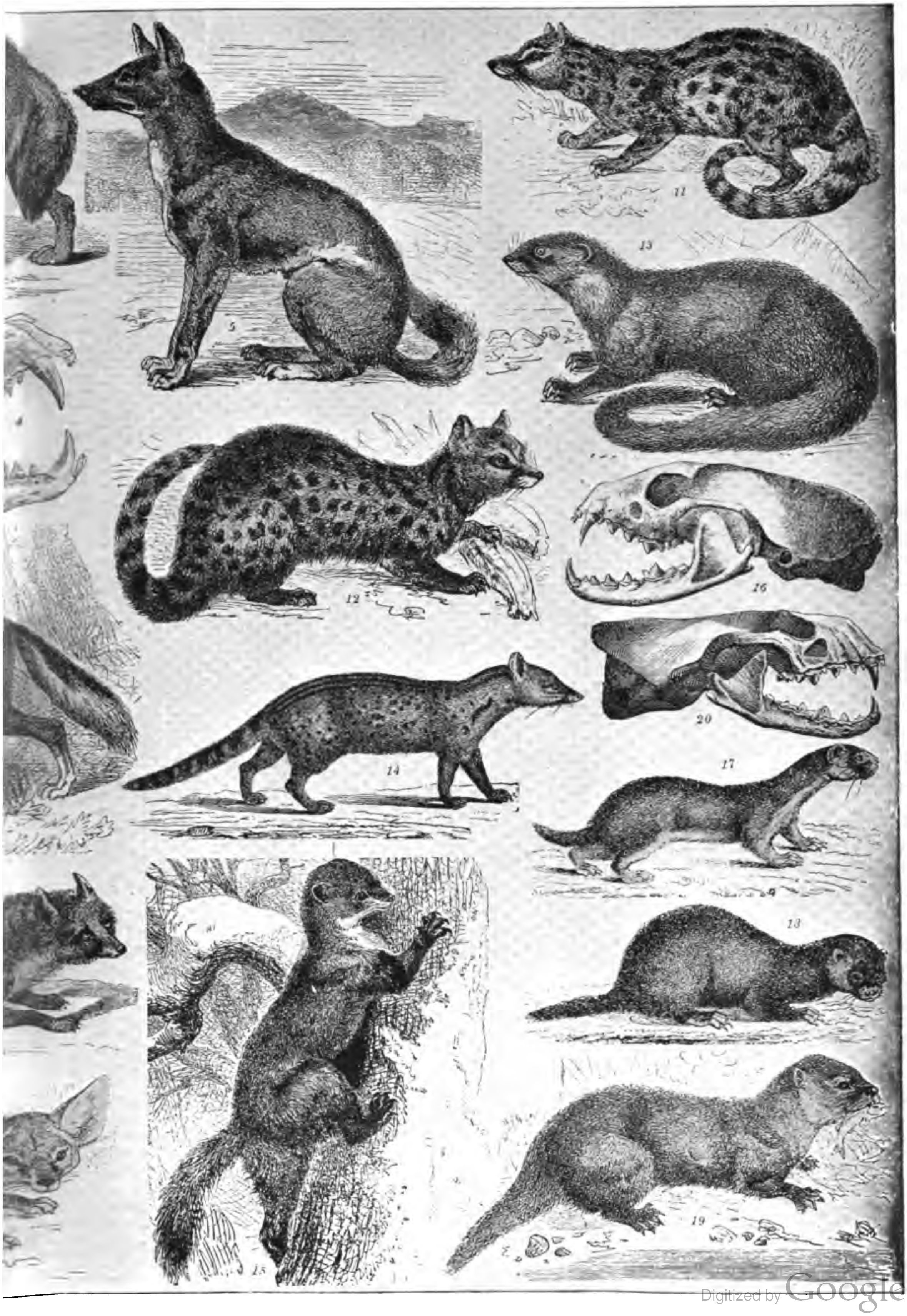


Fig. 1 Aard Wolf 2 Hunting Dog or Hyena-Dog 3 Wolf 4 Skull of Wolf 5 Dhole or Kholsun 6 Jac
14 Rasse 15 Marten 16 Skull of Marten 17

S ANIMALS.— II



1 7 Brazilian Fox 8 Common Fox 9 Fennec 10 Civet 11 Genet 12 Zibet 13 Ichneumon
easel 18 Polecat 19 Otter 20 Skull of Otter

and Lower Miocene connect the civet stock with the apparent ancestors of the fur-bearers (weasels, badgers, otters, etc.). It is not, indeed, until the late Miocene, near the end of the Tertiary period, that the groups of Carnivora as we now see them became distinctly set apart from one another by the dying out of the old intermediate stock forms.» Consult Osborn, 'Age of Mammals' (New York 1910); Scott, 'History of Land Mammals in the Western Hemisphere' (New York 1913).

CARNIVOROUS PLANTS, plants of various genera which subsist partly upon insects and other small animals which they entrap in various ways. The apparatus in each case is a modified leaf or part of a leaf, and in some cases the modifications are so curious, so well adapted to the use to which they are put, and so perfect in action, that the plants seem almost intelligent. The object sought by these plants seems to be to supply themselves with nitrogenous food, which is generally in meagre supply where they usually live — undrained swamps. Probably, too, such carnivorous plants as do not live in these habitats formerly did, but have not yet lost the use of the apparatus. A case of this kind is exhibited by the genus *Utricularia* (see BLADDERWORT). In this genus various species provided with active bladders, which act like eel-traps, live submerged in ponds; other species, also possessing active but less perfect and useful traps, live in the marshy soil of swamps. Still others live on dry ground, but these have usually abortive traps. The conclusion is that as the ponds became swamps, and the swamps were converted into dry land, the supply of nitrogenous food increased, and hence the traps became aborted, because they were no longer needed.

Probably the most nearly intelligent of these carnivorous plants is the Venus' fly-trap (*Dionæa*), found in North Carolina. The trap (leaf-blade) consists of two pieces hinged together. On the margins are bristles, and in the interior a few sensitive hairs, which, when touched, act like a trigger, and the apparatus closes. Should an insect cause this action the bristles will prevent its escape and the trap will remain closed until digestion is complete, when it will open, cast out the indigestible portions and be ready for another victim. If the trap fails to catch its prey, or if it be sprung by something it cannot utilize, it will open again in a short time. In the sundew (*Drosera*) the leaves are not provided with glandular hairs, which close over the insect that alights upon the leaf, and a glistening sticky substance holds it fast until its digestible parts are absorbed by the plant.

In the pitcher-plants (*Sarracenia, Nepenthes*), the pitcher consists of a tube-like leaf either with or without a lid or hood. Around the mouth there is usually a sugary secretion which acts as a lure. The insect that alights cannot escape because the tube is lined with hairs that force him downward to the bottom of the tube, which is usually partly filled with water. Some other genera in which the carnivorous habit is developed are *Darlingtonia, Aldrovandra* and *Pinguicula*. Consult Darwin, 'Insectivorous Plants.'

CARNOCHAN, kär'nō-kăn, **John Murray,** American surgeon, famous for his bold and skilful operations: b. Savannah, Ga., 4 July 1817; d. New York, 28 Oct. 1887. He studied at Edinburgh and at various European universities; and began his practice in New York in 1847. In 1851 he became professor of surgery at the New York Medical College, and surgeon-in-chief to the State Immigrant Hospital. At one time he cured neuralgia by excising the whole trunk of the second branch of the fifth pair of nerves. In 1852 he tied the femoral artery to cure exaggerated nutrition. He also tied the primitive carotid artery on both sides, to cure elephantiasis of the neck. In 1853 he exsected the entire radius, in 1854 the entire ulna. He published a treatise on 'Congenital Dislocations' (1850); a translation of Rokitausky's 'Pathological Anatomy,' and 'Contributions to Operative Surgery' (1858 and 1877–86), besides numerous monographs of value on subjects connected with his profession.

CARNOT, kär-nō, **Lazare Hippolyte,** French statesman and journalist, second son of the following: b. Saint Omer, 6 April 1801; d. 16 March 1888. He studied for the law but was debarred from practice for refusing to take the oath of allegiance to the Bourbons. He was of liberal opinions, became a disciple of Saint Simon, and wrote the 'Exposition générale de la doctrine Saint Simonienne,' the authorship of which was, with his consent, ascribed to Bazard. He became editor of *Le Producteur,* a radical journal of the day. But as soon as Saint Simonism assumed the form of a religious creed, Carnot parted with his friends, and became a journalist, and the chief editor of the *Revue encyclopédique*. He was also entrusted with the publication of Grégoire's and Barères 'Mémoires.' He was elected to the Chamber of Deputies in 1839, and re-elected in 1842 and 1846. After the revolution of February 1848, he was Minister of Public Instruction until 5 July, and improved, as such, the condition of the teachers, rendered the normal schools free and established free lectures. In 1848 he was elected to the Constituent, and 10 March 1850, to the Legislative, Assembly. After the *coup d'état* of December 1851, he left France; during his absence, he was elected a member of the *corps législatif,* but refused to take the oath. He was re-elected in 1857, but again refused to serve. He did not take his seat until 1864, and was made a life senator in 1875. He spoke for the last time in 1888, a few weeks after his son Sadi had been elected President of the Republic, and was the author of 'Mémoires sur Carnot par son fils' (2 vols., 1861–64); 'La Revolution française' (2 vols., 1867); 'Lazare Hoche' (1874); and with M. d'Angers, 'Mémoires de Bertrand Barère' (4 vols., 1842–43). For his biography, consult the Proceedings of the Académie des Sciences, Morales et Politiques (Paris, January 1894); also Hubbard, 'Une famille républicaine: les Carnots' (Paris 1888).

CARNOT, Lazare Nicolas Marguerite, French soldier and statesman: b. Nolay, Burgundy, 1753; d. Magdeburg, 2 Aug. 1823. From his youth he exhibited an uncommon talent for the mathematical and military sciences, entered the corps of engineers, and rose in office by the favor of the Prince of Condé. He published, afterward, 'Mathematical Essays,' which caused him to be elected a member of several learned societies. His eulogy on Vauban received the prize of the Academy of Dijon. In 1791 he was appointed deputy to the Constituent Assembly, but at first took part only in military affairs. On his proposal the officers of the nobility were removed from the army, and others substituted from the citizens. He also proposed that implicit obedience should only be demanded of the soldier in presence of the enemy, at other times he should have all the privileges and rights of the citizen; a strange proposal to come from a military chief. As a member of the convention he voted for the death of Louis. In the following March he was sent to the Army of the North, where he put himself at the head and repulsed the enemy. On his return to the convention he was made a member of the Committee of Public Safety. The influence of Carnot in the military operations now began to be more deeply felt. In possession of all the plans deposited in the archives of Louis XIV, he organized and directed the French armies; and his direction undoubtedly contributed very much to their success. After the fall of Robespierre he was often accused, but always acquitted, because his duty had been to take care of the defense of the country, and he could not be made answerable for the cruel decrees of Robespierre, in which Carnot's name, as he was a member of the committee, was of course to be found. At the establishment of the Directory in 1795 Carnot was chosen a member, and for some time maintained an important influence. Barras at length succeeded him in the Department of War, and was ever after his enemy. His plan for the overthrow of Barras was unsuccessful, and with some others he was sentenced to transportation on the 18th Fructidor (4 Sept.) 1797. He fled to Germany and published a defense, which was eagerly read in Paris, and by the exposure of the conduct of his former colleagues hastened their overthrow on the 30th Prairial (18 June) 1799. After the 18th Brumaire Carnot was recalled, and appointed *inspecteur aux revues,* and two months later, in April 1800, Minister of War. He soon after retired into the bosom of his family, but was called to the tribunate, 9 March 1802. He often opposed the views of the government, voted against the consulship for life, and his was the only voice raised against the proposal for the Imperial dignity. He remained, however, a member of the tribunate till it was abolished, passed the next seven years of his life in retirement and published several valuable military works. In 1814 Napoleon gave him the chief command at Antwerp. He connected a vigorous defense with a careful regard for the interest of the city, which, by the command of Louis XVIII, he afterward surrendered to the British General Graham. He still retained his titles and his honors, but as a firm republican he could never expect the favor of the court; particularly as, in his memorial to the King, he openly and severely censured the measures of government, in consequence of which he was passed over in the new organization of the Academy of Sciences. When Napoleon was once more at the helm of state in 1815, he made Carnot count and peer of the empire, and pressed upon him the Ministry of the Interior. Carnot discharged the difficult duties of this office with his usual integrity. After the Emperor's second fall he was made a member of the provisory government of France, and was afterward the only one of the members of it comprehended in the ordinance of 24 July. He retired to Cerney, where he employed his pen on political subjects; then to Warsaw with his family; and finally to Magdeburg. Among Carnot's writings the most valuable are his 'Essai sur les machines'; 'Réflexions sur la métaphysique du calcul infinitésimal'; 'Sur la géometrie de position'; 'De la défense des places fortes'; 'Exposé de la conduite politique de Carnot, depuis le 1 Juillet 1814.' In Magdeburg Carnot published 'Mémoire sur la fortification primitive'; and a volume of poems. He was rigid in his love of virtue, a scholar, a general and an inflexible republican. He was universally esteemed, both in France and in foreign lands, and was honored by all parties. Consult Arago, 'Eulogy of Carnot' (in Vol. I of Arago's 'Œuvres complètes,' Paris 1854).

CARNOT, Marie François Sadi, President of the French Republic, grandson of Lazare Nicolas Carnot (q.v.): b. Limoges, 11 Aug. 1837; d. Lyons, 24 June 1894. He was educated at the École Polytechnique and became a civil engineer. His construction of the large tubular bridge at Colognes-sur-Rhône brought him to the public's attention. He was stationed as government engineer at Annécy in 1870 and in 1871 M. Gambetta appointed him prefect of the Seine-Inférieure, entrusting him with the duty of seeing to the defenses of his department, a task which he fulfilled with great ability. After Paris capitulated, he resigned, to become deputy from Côte d'Or in the National Assembly. In 1876 he was elected member of the new Chamber of Deputies; the year following, secretary to that Chamber; and occupied and important post with the Public Works Committee, becoming its minister in 1880–81, and was re-elected in 1885 in M. Brisson's Cabinet; in 1886 he became Minister of Finance, retaining this post under Brisson's successor, De Freycinet. In 1887 he was elected President of the French Republic in succession to M. Jules Grévy, but before his term of office had expired he was assassinated at Lyons by an Italian anarchist named Caserio. Consult Hubbard, 'Une famille républicaine, les Carnot' (Paris 1888).

CARNOT, Nicolas Léonard Sadi, French physicist: b. Paris, 1 June 1796; d. there, 24 Aug. 1832. He was educated at the polytechnic school; in 1814 he entered the engineer corps, where he served until 1828, becoming captain in 1826. In 1824 he published his book, 'Reflexions sur la puissance motrice du feu,' in which he laid down the principle that the efficiency of a thermodynamic engine is proportional to the amount of heat transferred from the source of heat to the condenser; and that heat passes only from a warmer to a colder body. This is called the second law of thermodynamics and is known also as Carnot's principle. It is also significant that he observed the principle of the constant quality of energy, a theory which was later developed as that of the "conservation of energy." An English translation of his great work was made by R. H. Thurston; Kelvin's elaboration is appended (New York 1890).

CARNOTITE, a mineral first described in 1899, and now one of the most important ores of uranium. It is a hydrous vanadate of uranium and potassium, its formula being, perhaps, $K_2O.\ 2U_2O_3.\ V_2O_5.\ 3H_2O$. Radium has been shown to be present in it and radiographs may be made from the crude mineral. It seems likely that it will become an important ore of radium. It is a canary-yellow crystalline powder, usually occurring disseminated through sandstone, but sometimes in earthy masses of considerable richness. Its chief locality is in Montrose County, Colo., but it has recently been reported from Utah.

CARNUTES, kär-nū'tēz, or **CARNUTI,** an ancient tribe living in central Gaul, at war with Cæsar in 52 B.C., having joined Vercingetrorix. Cæsar burnt their chief town, called Cenabum. Augustus made the Carnutes, a «civitas fœderata» (an allied state) and permitted them to retain their own institutions. Their chief city was also called Carnutes. Consult Holmes, ‘Cæsar's Conquest of Gaul’ (2d ed., Oxford 1911).

CARO, kä'rō, **Annibale,** Italian author: b. Civita Nuova 1507; d. 1566. In 1543 he was appointed secretary to Pietro Ludovico Farnese, Duke of Parma and Piacenza, who entrusted him with several missions to Charles V. After the assassination of the Duke his own life was in considerable danger. He took refuge in Parma, and was treated in a friendly manner by the new Duke, Ottavio Farnese, whose two brothers, the cardinals, Ranuccio and Alessandro, took him successively into their service. With the latter he remained from 1548 to his death in 1566, and received from him several ecclesiastical preferments. Caro devoted himself chiefly to the study of numismatics and the Tuscan language, and his pure and elegant style in verse and prose soon became generally admired. His translation of the Æneid in blank verse is excellent. After his death appeared a translation by him of Longus, and of Aristotle's ‘Rhetoric’; also ‘Rime’ (1569), and ‘Lettere familiari’ (1572–75), the former of which are admired for the elegance of the verse, and the latter as models of beautiful Italian prose. The best editions of Caro's works were published in Venice (1757), in Milan (1806), and a volume of selected works appeared in Florence (1864).

CARO, Elme Marie, French philosopher: b. Poitiers, 4 March 1826; d. 13 July 1887. He studied at the Stanislas College and the École Normale, graduating in 1848. He was at first professor in several provincial universities, and, having received the degree of doctor, was appointed master of conferences at the École Normale (1858). In 1861 he became inspector of the Academy of Paris; in 1864 professor of philosophy; in 1874 a member of the French Academy. He married Pauline Cassin, the author of ‘Péché de Madeleine.’ He was a very popular lecturer on Christianity. He contributed to magazines; and wrote ‘L'Idee de Dieu’ (1864); ‘La Philosophie de Goethe’ (2d ed., 1880); ‘Etudes morales sur le temps present’; ‘Mélanges et portraits’ (1888).

CARO, Jakob, German historian: b. Gnesen, 2 Feb. 1836; d. 1904. He was educated at Berlin and Leipzig, traveled in Galicia and southern Russia, and in 1863 became lecturer at the University of Jena and later professor; in 1868 he was professor at Breslau. He has written ‘Das Interregnum Polens 1856’ (1861); ‘Liber Cancellariæ Stanislai Ciolek’ (1871–74); ‘Lessing und Swift, Studien über Nathan den Weisen’ (1869); ‘Aus der Kanzlei Kaiser Siegsmunds’ (1879); ‘Das Bundniss zu Canterbury’ (1880); ‘Beata und Halszka, eine Polnisch-Russische Geschichte aus dem 16. Jahrhundert’ (1880); and a continuation of Röpell's ‘Geschichte Polens.’

CARO, Mich., village and county-seat of Tuscola County, on the Cass River, 25 miles southeast of Bay City, on the Michigan Central and the Detroit, Bay City and Western railroads. It contains flour mills, grain elevators, lumber mills, foundries, machine shops, beet-sugar refinery, telephone works, marble yards, brick and tile works, harness factories and a fireless cooker manufactory. Beans and sugar beets are extensively cultivated in the neighborhood. Pop. 2,272.

CAROB, kär'ōb, a tree, *Ceratonia siliqua,* of the family *Cæsalpiniaceæ,* native of the Mediterranean region, now widely cultivated in warm countries. It is known also as algaroba, karoub, carouba and Saint John's bread. It has shining pinnate leaves, racemes of red flowers, and flat pods 4 to 12 inches long filled with a pulp in which are embedded numerous seeds. The pods are an important forage crop in some countries, being eaten by all kinds of stock, and they are frequently used for human food, the sweet pulp being very palatable. They are reputed to be the locusts and wild honey found by Saint John in the wilderness, hence one of the common names. Thousands of tons of the pods are imported into England annually to be ground and used for stock-feed. In the United States they are sometimes seen on fruit-stands. The seeds are said to have been the original carat weight of goldsmiths.

CARŌE, ka'rō-ę, **William Douglas,** English architect of Danish parentage: b. Liverpool 1857. He was educated at Trinity College, Cambridge, and studied architecture with the eminent architect, John L. Pearson. He is architect to Southwell Cathedral, to the dean and chapter of Canterbury and to the ecclesiastical commissioners. Among his principal works are the archbishop's palace at Canterbury; bishop's palace at Bristol; Saint David's Church at Exeter; Wycombe Abbey School; the Jubilee Monument to Queen Victoria at Mentone, France. He has also restored many buildings of historic interest. He was president of the Architectural Association in 1895.

CAROL, a song of praise sung at Christmas or Easter. It originally meant a song accompanied with dancing, in which sense it is frequently used by the old poets. It appears to have been danced by many performers, by taking hands, forming a ring and singing as they went round. It has been said that the oldest carol was that sung by the heavenly host when the birth of the Saviour was announced to the shepherds on the plains of Bethlehem. It is probable that the practice of singing carols at Christmas-tide arose in imitation of this, as the majority of the carols declared the good tidings of great joy; and the title of Nöels, nowells or novelles, applied to carols, would seem to bear out this idea. Carol singing is of great antiquity among Christian communities, as the carol by Aurelius Prudentius, of the 4th century, will show. The Middle Ages were especially familiar with these songs. The first authorization for a collection of such carols to be made was issued to Thomas Tysdale (1562). For a while they disappeared under the Puritan régime, but with the Restoration a new book appeared called 'The New Carols for the Merry Time of Christmas, to Sundry Pleasant Tunes.' In England, the custom of "waits," i.e., groups of boys and men who go about singing in the village, still prevails in some sections. 'Hark the Herald Angels Sing,' (1739) and 'While Shepherds Watched Their Flocks by Night' are two well-known carols. Collections have been made by H. R. Bramley and Sir J. Stainer under the title 'Christmas Carols, Old and New' (London 1874); and by Martha E. Rickert, 'Ancient Christmas Carols, 1400–1700' (New York 1910).

CAROLAN, or O'CAROLAN, kăr'ō-lăn, **Turlogh,** Irish musical genius: b. near Nobber, County of Westmeath, about 1670; d. 1738. Having lost his sight at the age of 16, he studied the harp, and in after life not only maintained himself thereby, but even became famous. A collection of his ballads was published during the 18th century, but others have been handed down by the peasantry.

CAROLI, Pietro Francesco, Italian painter: b. Turin 1638; d. Rome 1716. He studied painting at Venice, Florence and Rome, and was professor in the Academy of Rome at his death. He is celebrated for his careful execution and beautiful coloring, and excelled particularly in perspective, of his skill in which he has left excellent specimens in his drawings of the interior of some of the Roman churches. Consult de Boni, F., 'Biografia degli artisti' (Venice 1840).

CAROLINA, P. R., town 15 miles southeast of San Juan, with which it is connected by rail. It is well built, has a fine climate and is in good sanitary condition. It contains a city hall, public schools and churches. Dairy farming and sugar-planting are the chief industries. Pop. 3,250.

CAROLINA, kä-rō-lē'nä. This name is generally given to a famous law of the German Empire, of the year 1532, under Charles V, which he himself called an ordinance of criminal procedure (*Peinliche Gerichtsordnung*). From him it was a later period called *Constitutio criminalis Carolina,* or shortly *Carolina.* The arbitrary administration of justice, the disorder and cruelty which had become customary in the courts of Germany, where many a process was begun and ended with torture, and persons were sentenced even to death without regular process, gave occasion to this law. From the beginning of the peace of the land the necessity of such a law was felt throughout the country; but it was difficult in this, as in all other cases, to make the different members of the empire agree on one general measure. The Baron Johann von Schwarzenberg was chiefly instrumental in introducing this ordinance. He became Minister of State of the Prince-bishop of Bamberg, and succeeded in procuring an ordinance of criminal procedure for Bamberg to be drawn up and published in 1507. The same was also adopted in 1510 by the Margrave of Brandenburg and Franconia; and at last a law of criminal procedure for the empire at large was passed by the Diet at Ratisbon, in 1532. The Carolina contains 219 articles, which regulate the standing and oaths of judges, the character of witnesses, the penalties of different crimes, and the circumstances in which torture at that time common in criminal jurisprudence should be applied. Several German princes, as the Elector of Saxony, the Elector of Brandenburg, and of the Palatinate, protested against it, in order to protect the laws of their states and their own privileges against the legislative power of the Emperor; but at last the Carolina was established in almost every part of the empire. From the connection of Switzerland with Germany, and the fact that several Swiss towns were Imperial cities, German laws frequently passed into Switzerland, and the Carolina became the law by which even the Swiss troops in the service of the kings of France were governed until the French Revolution. Consult Zöpfl, 'Die peinliche Gerichtsordnung Kaisers Karl V' (Leipzig 1883); Esmein, 'Histoire de la procédure criminelle en France' (Paris 1882, pp. 300ff.); Daguin, F., 'Introduction d'un code de procédure pénale allemande' (Paris 1884, pp. 30ff.).

CAROLINA, Original Constitution of. For many years after the subversion of the old English order by political and religious insubordination, 1642–60, the dominant idea of the conservatives was to prevent its recurrence, as with the conservatives after the French Revolution; and their chief dread was of republicans and dissenters. It is an almost grotesque incident of this reaction, that by far its narrowest embodiment came from a liberal philosopher and an unbelieving incendiary politician,—John Locke and Lord Shaftesbury (Anthony Ashley Cooper). A group of eight noblemen, headed by the famous Lord Clarendon, and including Shaftesbury, were granted, on 24 March 1663, a tract called the province of Carolina, after Charles II; as extended 30 June 1665, it included the present North and South Carolina and Georgia, and in theory stretched west to the Pacific. "To avoid erecting a numerous democracy," in their own words, they had Locke, who was Shaftesbury's secretary, draw up (whether on his own lines or Shaftesbury's is a moot point) a form of government called the "Fundamental Constitutions," which is a classic for impractical absurdity even among Utopias. The mass of the people (not alone, be it remembered, the future immigrants, but a considerable population already living there in pure democracy) were to be hereditary "leet-men," or serfs of the soil. Next above them was a sort of upper middle-class commons called "lords of the manor," who could let out 10-acre tenant farms. Over both (as the charter gave the proprietors the right to create titles of nobility other than English ones) were a fantastic self-perpetuating colonial *noblesse,* of "landgraves" and "caciques." Crowning the whole were the proprietors; the eldest was "palatine" or viceroy, the others were admiral, chamberlain, high constable, chief justice, chancellor, high steward and treasurer. The "leet-men" held three-fifths of the land; the nobility and "lords of the manor" one-fifth, not to be alienated after 1700; the proprietors the remaining fifth. The province was divided checkerboard fashion into squares, first of counties; then each county into eight «seigneries» for the proprietors, eight «baronies» for the nobility (each seignory and barony to contain 12,000 acres, perpetually annexed to the title), and four «precincts,» and each precinct into four «colonies» for the serfs. There was a parliament; but the commons were carefully kept powerless by giving them only 10 members out of 50, making only freeholders of 500 acres eligible to seats, and electing them for life; with the further proviso that landgraves could sit in either house at will, and vote on the same measures in both. All initiative was in a supreme executive council, which prepared and submitted all legislation to Parliament; and the proprietors had a veto on all. Each proprietor had a superior court at which he presided in person or by proxy; each nobleman held a court-leet for his barony, and there were precinct courts. The laws were worthy of this closet constitution. The English Church was established and supported by public taxation, in a province inhabited largely by Quakers, and the rest by Scotch Presbyterians, Huguenots, Lutherans, etc. No one could live or hold property in or be a freeman of the province who did not acknowledge God, and that he is to be publicly worshipped. Every person above 17 not a member of some church, or who did not subscribe the «Fundamental Constitutions» and promise in writing to defend and maintain them, should be an outlaw. There was a severe censorship of the press, of ceremonies, of fashions and of sports, in the hands of the nobility. Paid lawyers were prohibited; thus compelling the commons to put themselves under a relation of «clientage,» in Roman fashion, to the nobility to avoid ruin. All commentaries on the constitution or laws were forbidden. This constitution was to replace one under which the people were ruled by a council of 12, chosen half by the proprietors and half by the assembly; that assembly consisting of 12 elected freeholders, so that the people had 18 out of 25 votes; with entire freedom of religion, civil marriage, security for five years from suit on cause arising outside of the country (for protection of emigrant debtors), exemption from taxation for the first year and no political or social superiors anywhere. That is, free Englishmen in virtual democracy were to become at a blow the serfs and villeins of the time of the Norman Conquest. The proprietors bound themselves by solemn compact to maintain this incredibly foolish instrument as unalterable forever, and evidently expected men to emigrate to a savage wilderness on such terms. Five successive forms of this constitution were promulgated before its entire abandonment in 1693, each in turn proclaimed permanent and unalterable; and the result, especially in Albemarle County (afterward North Carolina), was simple anarchy. The people set them utterly at naught; and while the former system had been legally abolished, it continued in force by sufferance. Resistance to law as a first principle of life became ingrained in them; and the character of the colony was long and deeply injured by the quarter-century of attempt to force its people, new and old, into this iron mold of extreme feudalism. For further history see NORTH CAROLINA; SOUTH CAROLINA.

CAROLINA ALLSPICE. See CALYCANTHUS.

CAROLINA-PINK, MARYLAND PINKROOT, or WORM-GRASS, names given to the *Spigelia marilandica*, a plant of the order *Loganiaceæ*, bearing scarlet flowers, and having a root used as a vermifuge. It occurs in rich woods and extends from New Jersey west, north and south to Wisconsin and Texas.

CAROLINA RIDGE, in geology, the name given to an elevation of the bottom of the Atlantic Ocean off North Carolina, that occurred in Miocene time. It deflected the Gulf Stream and caused a great change in climate along the Atlantic Coast. See MIOCENE; TERTIARY PERIOD.

CAROLINE, The, an American steamboat used in 1837 by the American sympathizers with the Canadian insurgents under William Lyon Mackenzie (q.v.). The latter, after years of agitation, had gathered a band of insurgents in December, and attempted to seize Toronto, capture the lieutenant-governor and his cabinet and proclaim a republic. He was defeated, and fled to Navy Island on the British side of the Niagara River. Some hundreds of American sympathizers joined him, and he set up a «provisional government,» issued paper money and offered bounties for volunteers and a reward for the apprehension of the lieutenant-governor. On 29 December an American steamer, the *Caroline,* crossed over to his camp from Schlosser on the American side, laden with reinforcements, provisions and munitions; and returning, lay at Schlosser that night full of men presumably ready for a similar trip the next day. The Canadians, incensed at this outrageous violation of neutrality, sent over an armed party in boats to enforce it. They boarded the *Caroline,* hustled the passengers and crew ashore, killing one man (Amos Durfee) on shore in the fray, towed the vessel out into the stream, set it on fire and sent it over Niagara. A great uproar ensued. President Van Buren issued a proclamation ordering the neutrality laws to be respected, and, calling out the militia under Winfield Scott, he then demanded reparation from the British government. The latter naturally showed no great alacrity in responding. Shortly afterward, one Alexander McLeod came over to the American side, boasting that he was one of the boarding party and had killed one of the *Caroline's* men with his own hand. He was arrested, indicted by the grand jury for the murder of Durfee and imprisoned to await his trial. Fox, the English Minister, demanded his release; the Secretary of State (Forsyth of Georgia) replied that he was in the hands of justice in New York State and must await its course; Lord Palmerston thereupon assumed for the English government full responsibility for the assault on the *Caroline* and again demanded his release. But Fox in his letter curiously added that the government had every reason to believe that McLeod was not one of the boarding party; in which case, of course, he was either a mendacious braggart or a common murderer, and the matter of the *Caroline* was irrelevant. Webster, now Secretary of State, replied, ignoring this point, that if the case were in a Federal court the President would order a *nolle prosequi* entered; but it being in a State court, he could only await its action, and if it did not discharge McLeod, the case should go up to the United States Supreme Court. In the July term of 1838 a writ of *habeas corpus* was sued for in the New York Supreme Court, but refused. McLeod was acquitted, however, and the whole affair dropped. See Canada — Diplomatic Relations of the United States with.

CAROLINE AMELIA ELIZABETH, Queen of England, wife of George IV, King of Great Britain and Hanover, second daughter of Duke Charles William Ferdinand of Brunswick: b. 17 May 1768; d. London, 6 Aug. 1821. She was married to the Prince of Wales, afterward George IV, in 1795. After the birth of her daughter, Charlotte Augusta (7 Jan. 1796), her husband abandoned her, declaring that no one could force his inclinations. This was the beginning of the disgraceful dispute between the two parties, which lasted till the death of Caroline, and exposed her honor to repeated accusations from her husband. The Princess of Wales lived retired from the court, at a country-seat at Blackheath, till 1808. In 1813 the contest was renewed between the two parties, the Princess of Wales complaining, as a mother, of the difficulties opposed to her seeing her daughter. In 1814 the Princess obtained permission to go to Brunswick, and afterward to make the tour of Italy and Greece, in which the Italian Bergami was her confidant and attendant. Many infamous reports were afterward circulated, relating to the connection between the Princess and Bergami. When the Prince of Wales ascended the throne, 29 Jan. 1820, he offered her an income of £50,000 sterling, on condition that she should renounce the title of Queen of England, and every title appertaining to that dignity, and should not again return to England. She refused the proposal, returned to England, 5 June, and the next day entered London amid public demonstrations of welcome. She was now tried for adultery, but not convicted, and in this trial Brougham acted as the Queen's attorney-general. Though banished from the court, the Queen still lived at Brandenburg House, maintaining a style suitable to her rank. She was refused admission to Westminster Abbey on the occasion of the coronation of her husband, on 19 July 1821, and published a protest in the newspapers. Her tomb at Brunswick has a very short inscription, in which she is called the unhappy Queen of England. Consult Nightingale, 'Memoirs of Queen Caroline' (London 1820); Adolphus, 'Life' (London 1821); Huish (London 1821); Wilk (London 1822); also Clerke, 'Life of Her Majesty Queen Caroline' (London 1821).

CAROLINE BOOKS, or LIBRI CAROLINI, a theological work in four books, prepared under the direction of Charlemagne (Carolus Magnus), in connection with the disputed question of image worship that seriously agitated the Church during the reign of that monarch. The second synod of Nicæa had given its approval to the use of images, agreeing in this point with the views of the Eastern Church. Owing to a misunderstanding of the Nicæan canons through a bad translation, which seemed to make the Eastern synod declare that the worship due to God alone, *latria,* should be paid to images, the 'Libri Carolini' severely reviewed the doctrine. The condemnation of image worship as formulated in the Caroline Books does not, however, bear upon the inferior honor, *dulia,* paid to the saints and their images, or that given to the Virgin, *hyperdulia.* The author is unknown. Consult Hefele, 'Conciliensgeschichte' (Vol. III, bk. XX, chap. II, 2d ed., Freiburg 1877).

CAROLINE ISLANDS, a large archipelago in the north Pacific Ocean, between lat. 3° and 12° N., and long. 132° and 163° 6′ E., and between the Philippines and the Marshall Isles. Area, about 560 square miles. It contains many groups, embracing in all about 525 islands and islets. Many of them are mere coral reefs, little elevated above the ocean. The most westerly group is the Paloas, or Pelew Islands, which contain seven large and many small ones, all of coral formation. The next group, Yap or Gouap, lies northeast of the last. In its chief island, which is mountainous, precious metals have been found. The other principal groups are Lutke, Mortlock, Siniavin, Enderby and Hogoleu. The most easterly island is Ualan. The most important vegetable productions are palms, bread-fruit trees and bananas. Copra is also an important product, while some of the islands also yield shells. The commerce is mostly in the hands of the German Jaluit Company, which has stations on every important island. The inhabitants, numbering about 55,000, though mainly Micronesians, include various races, and have made very different degrees of progress in civilization. In the central groups they are of a handsome physical type, active and industrious, and have some commerce. On the east generally, and on the west, with the exception of the Pelew Islands, the inhabitants, though apparently of the same stock, are far less advanced. The islands were discovered in 1527 by the Portuguese, who gave them the name of Sequeira. In 1686 they were annexed and renamed in honor of Charles II by the Spaniards, who soon changed the name to New Philippines. After several futile missionary attempts in the 18th century, Spain took little active interest in the group until August 1885, when the German flag was raised over Yap. A serious dispute followed this act, and the question being submitted to the Pope as arbitrator, he decided in favor of Spain, reserving special trade privileges to Germany. In 1887 disturbances broke out at Ponapé, in which the governor, who had arrested one of the American Protestant missionaries, was killed by the natives; but the rising was soon suppressed. In February 1899 Germany purchased from Spain for about $3,300,000 the Caroline and Pelew Islands, and all of the Ladrones, but Guam, which had been ceded to the United States in the treaty of peace that ended the Spanish-American War. Consult Christian, 'The Caroline Islands' (1899); Furness, 'Island of Stone Money' (1910); Salesius, 'Die Karolinen Insel Jap' (1904).

CAROLINE MATILDA, Queen of Denmark, daughter of Frederick Louis, Prince of Wales: b. 1751; d. Celle, Hanover, 10 May 1775. She was married in 1766 to King Christian VII of Denmark. She became the object of court intrigues caused by the jealousy of the grandmother and stepmother of her husband. These led to the execution for treason of Counts Struensee and Brandt, who were of the Queen's party, and to the imprisonment of the Queen herself, who was liberated through the interference of her brother, George III of England. She received a pension of £5,000 and was allowed to retain the title of Queen. She spent her last years in a castle at Celle, Hanover. Her last hours are described in a small work, ‹Die Letzten Stunden der Königin von Dänemark.› Consult Lagrèze, ‹La reine Caroline-Mathilde› (Paris 1887), and Wilkins, ‹A Queen of Tears.›

CAROLINGIANS. See Carlovingians.

CAROLUS, a gold coin struck in the reign of Charles I, and originally 20 shillings in value, afterward 23 shillings. The name was given also to various other coins.

CAROLUS-DURAN, kä-rō-lüs-dü-rän, **Auguste Emile,** French portrait painter: b. Lille, 4 July 1838; d. Paris, 18 Feb. 1917. His name was originally Charles Emile Auguste Durand. He studied under Souchon at the Lille Academy of Art, and afterward in Paris, where he copied the old masters in the Louvre, especially Velasquez and Leonardo. In 1861 he obtained the Wicar prize for painting and went to Italy and Spain, continuing his study of Velasquez, who remained his chief model. During his stay in Rome he completed his first important work, ‹The Evening Prayer.›

His first painting to receive a medal was a historical subject, ‹l'Assassine,› in 1866. It was presented to the Lille Museum by the French government. After 1866 Mr. Carolus-Duran turned his attention to portraiture, and in 1869 exhibited ‹The Lady with the Glove,› a full length portrait of his wife in outdoor costume. The portrait was placed in the Luxembourg. Mr. Carolus-Duran made a specialty of painting portraits of women and children. He had painted portraits of the Duchess of Marlborough, the Marchioness d'Adda, the Princess de Wagram, Mrs. Astor, the Countess of Warwick, the Comtesse Castellane, Queen Maria Pia of Portugal and the Princess Obolinsky. His first exhibit in America was at Philadelphia during the Centennial Exposition of 1876. He exhibited a portrait of Mlle. Sophie Croizette, a well-known actress, who was his sister-in-law. He made several trips to this country. On one occasion he gave a lecture at the Chase School of Art and illustrated it by painting a portrait. In 1889 he was made commander of the Legion of Honor and was made a director of the French Academy at Rome in 1905. He also was made president of the Société Nationale des Beaux-Arts and was a member of the Institute. He painted a series of historical and genre subjects, among them being ‹The Bathers›; ‹Gloria Mariæ Medici,› a decorative composition for a ceiling in the Louvre; ‹The Burial of Christ›; ‹Dawn› and ‹The Vision.› His portraits of men included those of Pope Pius X, Emile de Girardin, Gounod, Gustave Doré and Alphonse Carr. In his younger days Mr. Carolus-Duran gave fencing exhibitions and was known as one of the best swordsmen in France. He also showed skill as a sculptor. He married Mlle. Pauline Marie Croizette, herself an artist. Mme. Carolus-Duran received a medal at the Salon of 1875. The couple had a son who joined the French army.

Mr. Carolus-Duran was commander of the Order of Leopold, grand officer of the Order of Saint Maurice et Lazare, commander of the Order of Charles III of Spain, commander of the Order of Christ de Portugal and grand officer of the Legion of Honor. He received the Grand Croix of the Order d'Isabelle la Catholique of Spain and the Medaille de Sauvetage. Consult Muther, ‹History of Modern Painting› (New York 1907) and the biography by Alexandre (Paris 1902).

CARON, Réné Edouard, Canadian statesman: b. Sainte Anne, Lower Canada; d. 1876. He was educated at the Quebec Seminary and Collège Saint Pierre and called to the bar of Lower Canada in 1826. He was mayor of Quebec 1833–37 and was a member of assembly 1834–36. He was called to the legislative council in 1841, of which he was speaker 1843–47 and 1848–53. After holding office in the La Fontaine-Baldwin and Hincks-Morin governments, he became a judge of the Superior Court of Quebec, and afterward of the Court of Queen's Bench. He was one of the judges of the special Seigniorial Court, which in 1855 adjudicated on the questions arising out of the abolition of seigniorial tenures in Lower Canada.

CARORA, kä-rō'rä, Venezuela, city of the state of Lara, situated 95 miles south of Coro and 40 miles southwest of Barquisimeto on a tributary of the Tocuyo River. It was founded by the Spaniards in 1572. It has a considerable trade in gums, rubber and cochineal, tanneries and the raising of cattle, horses and mules are the chief industries. The city dates from the Spanish foundation of 1572. Pop. 6,000.

CAROTID ARTERY, either of the two great arteries which convey the blood from the aorta to the head and the brain. In the article on the aorta (q.v.) the origin of the carotid arteries is described — that from the right side springing from the innominate artery to supply most of the right side of the head; that on the left side arising directly from the aorta to supply all of the structures of the left side of the head. Apart from these slight variations in their origin on the two sides, the carotid arteries and their branches are practically duplicated in the two halves of the head. Thus the main branches, the common carotids, soon branch into two, the external and internal carotids. This division takes place about the level of the thyroid cartilage. The external carotid supplies the upper part of the front and side of the neck, the tongue, larynx, pharynx, face, the pterygoid regions, the upper part of the back of the neck, the scalp and the major portions of the brain membranes. The internal carotid soon enters the skull and supplies the greater part of the brain tissue, the orbital structures (the eye, etc.) and portions of the brain membranes. The branches of homologous arteries of the two sides anastomose somewhat, although many of the arteries of the brain are terminal arteries and do not anastomose. Occlusion of one of these vessels in the brain usually results in permanent injury. In deep cuts of the throat these arteries may be involved, but they lie very deep as a rule and are not often severed. (Morris, ‘Anatomy’; Gray, ‘Anatomy’).

CAROTIN (Lat. *carota*, «a carrot»), the coloring-matter of the carrot. It always accompanies chlorophyll and xanthophyll in the chlorophast, and is the coloring matter of some petals, fruits and other plant organs. The substances described by the terms erythrophyll, chrysophyll and etolin are probably carotin. Carotin is a hydrocarbon of the empirical formula $C_{40}H_{56}$ and is closely related to xanthophyll, which has the formula $C_{40}H_{56}O_2$ and is possibly an oxidation product of carotin. It differs from xanthophyll in its ease of crystallization, solubility in various solvents, slightly different melting points and spectra. It may be extracted from the chopped carrot by the action of carbon disulphide, in which (as also in benzene) it is very soluble. It crystallizes in small, red plates, which are insoluble in water and in alcohol. A similar compound, called «hydrocarotin,» is also known.

CAROTTO (kä-rō'tō) **FAMILY.** 1. Gian Francesco, jän frän-chĕs'kō, Italian painter: b. Verona 1470; d. there 1546. He studied under Liberale at Verona and under Andrea Montegna at Mantua. His earlier productions are in imitation of the style of Montegna; but at a later period the study of the works of Leonardo da Vinci and Raphael produced a decided change. Carotto is not distinguished by the grandeur of his conceptions, but excels in character and expression, and in the softness and warmth of coloring. Verona contains most of his works. Among these is the ‘History of Tobias,’ a series of pictures in the church of Saint Eufemia. Others are the fresco of the ‘Annunciation’ (San Girolamo 1508); the altar of San Fermo Maggiore (1528); various frescoes and panels in San Giorgio in Braida and several panels in the Pinacoteca Communale. Good examples of his art are in the Castello, Milan, the Chiesa di Carità, Mantua, in the Uffizi and Pitti, Florence, and in the museums of Dresden, Budapest, etc., 2. Giovanni, jō-vän'nē, Italian painter: d. 1555. He was the brother of Gian, and his pupil. He was chiefly an architectural painter and is celebrated for his copies of ancient ruins. He is also said to have given instruction to Paul Veronese.

CAROUGE, kȧ-roozh', Switzerland, a town of the canton of Geneva, on the left bank of the Arve, opposite Geneva, with which it is connected by a bridge. It has machine works, foundries, dye works and manufactures of watches. Founded in 1780 by one of the Sardinian kings as a rival of Geneva, the capital of the province of Carouge, it was ceded to Switzerland in 1816. Pop. (1911) 7,890.

CARP, a name applied to many fishes belonging to the *Cyprinidæ*. The members of this family inhabit fresh waters and are extremely numerous in genera, species and individuals. It is estimated that there are more than 1,000 species. One group of the family, found in North America, includes fishes known as suckers, buffalo-fishes, redhorses and mullets, while another group contains the minnows, dace, fatheads, chubs, etc. They are all soft-finned fishes, with a stout, serrated spine, which stands in front of both the dorsal and anal fins. There are no teeth in the mouth, but they are developed in the pharyngeal bones; that is, in the throat. The flesh is not of the best quality and is full of fine bones. The name carp is especially applied to one fish — *Cyprinus carpio*. This was introduced into North America from Europe by the United States Fish Commission, but it came originally from Asia. It inhabits our streams and lakes, where it is increasing rapidly in numbers. It reaches a length of two feet and may attain a weight of 40 pounds. It is a scaly, compressed, robust fish, with well-developed barbels and dorsal fin, and a short anal one; it is of brownish hue. Owing to its hardiness, its durability under extreme temperatures, the facility with which it may be raised because of its adaptability to sluggish ponds and swampy lakes, it might form an important element in the fish food-supply of the North American interior, since farmers can raise it easily in their mill-ponds. It feeds upon vegetable fare, larvæ, insects, etc., and during the winter months hibernates, at which time it requires no food. The eggs, also, are very hardy, and number several hundred thousands to each individual. They adhere to aquatic grasses and weeds.

The carp is usually covered with large scales; but one variety of it, the «mirror carp,» has only a few large scattered scales; while another species, the «leather carp,» is wholly without scales. Consult the publications of the United States Fish Commission, and Gill, ‘Smithsonian Miscellaneous Collections’ (Vol. XLVIII, Washington 1907).

CARP-SUCKER, a common and little-valued fresh-water fish of the genus *Carpiodes*, related to the buffalo-fishes and suckers. It is found throughout the central part of the United States, takes its name from its carp-like form, averages about two feet in length and is a dull green above, grading into silver beneath.

CARPACCIO, kär-pä'chō, **Vittore,** Italian artist: b. Venice about 1450; d. 1525. He was one of the most celebrated masters of the old Venetian school, and was the rival of Bellini and the last Vivarino. He studied probably with Bastiani, and came also under the influence of Gentile Bellini. All that is known of his life is that he belonged to Venice, of which he has reproduced in the background of his pictures the streets and monuments. His distinguishing characteristics are natural expression, vivid conception, correct arrangement and great variety of figures and costumes. He also excelled as an architectural and landscape painter. His favorite employment was the dramatic representation of sacred subjects, several of which he has illustrated by a series of paintings. Of these the most celebrated are the histories of Saint Ursula and Saint Stephen. The former, consisting of nine pictures, is now in the Academy of Venice, and has been engraved; the latter, in five pictures, is in Paris, Milan and Berlin. The ‘Madonna and Child Enthroned,’ supposed to be an earlier production, is in the National Gallery, London. He also painted a number of smaller pictures. The latest research on Carpaccio may be found in the monograph by Ludwig and Molmenti (Milan 1906; trans. by Cust, London 1907).

CARPANI, kär-pä'nē, **Giuseppe,** Italian dramatist and writer on music: b. Villalbese, near Milan, 28 Jan. 1752; d. Vienna, 22 Jan.

1825. Having prepared for the profession of the law, he afterward devoted himself to literary pursuits, and produced a great number of plays and operas, partly translations and partly original. In 1792 he was editor of the *Gazetta di Milano,* and wrote violent articles against the French Revolution. He was obliged to leave the city after the invasion of the French and went to Vienna, where he was appointed censor and director of the theatre. In 1809 he accompanied the Archduke John in the expedition against Napoleon. Under the title of 'Haydine,' he published a series of curious and interesting letters on the life and works of his friend Haydn, the composer. These letters, published in a French translation as an original work by L. A. C. Bombet, or, as other biographers state, by Beyle (known under the *nom-de-plume* of STENDHAL), gave rise to a great literary controversy, in which Carpani vindicated his authorship most successfully. Consult Tipaldo, 'Biographa degli Italiani illustri' (giving a complete list of the works of Carpani); Colomb, M., 'Notice sur la vie et les ouvrages de M. Beyle' (1846).

CARPATHIAN MOUNTAINS, a range of mountains in central Europe, forming for the greater part of their extent a natural boundary of Hungary, in the shape of a semicircular belt of nearly 800 miles in length, extending from Orsova on the Serbian frontier, to Pressburg. Its breadth is considerable, reaching a maximum of 240 to 250 miles, between the Banat and Transylvania. The Carpathian chain may be divided into two great sections, the East and the West Carpathians, the former curving from the mouth of the Nera to the source of the Theiss, and forming the boundary between Austria and Rumania; the latter proceeding from the sources of the Theiss and the Pruth, and terminating on the banks of the Danube west of Pressburg, and forming the boundary between Hungary and Galicia. To the western Carpathians belongs the remarkable group of the Tatra, in which is situated the culminating summit of the whole system, the Gerlsdorf Peak, 8,737 feet. Several other peaks exceed 8,000 feet. The loftiest summit of the eastern Carpathians reaches an elevation of 8,318 feet. The most remarkable and frequented passes are those of Teregova, leading from Orsova to Temeswar; of Vulkar, forming the valley in which the Schyl flows; and of the Rothenthurm, in a gorge formed by the Aluta at the foot of Mount Szurul. The outer bend of the Carpathians is much steeper than that which descends toward the valleys of Transylvania and Hungary. The only important rivers which actually rise in the chain are the Vistula, the Dniester and the Theiss. Small lakes abound in the interior of the mountains, some at great elevations and of great depth. The formation of the Carpathians took place mostly in the Tertiary period, and was practically completed at the end of the Miocene. The eastern part of the Carpathian chain, from Orsova to the source of the Burcza, near Kronstadt, is entirely composed of primitive rocks. These are succeeded by grauwäcke, which extends to the sources of the Theiss, and is only interrupted by a primitive group between the pass of Borgo and the source of the Viso. A great chain of trachyte appears on the frontiers of the Bukowina and stretches to the point where the Aluta begins to flow southwest. To the west of this chain, on approaching the plains, an extensive tract of sandstone belonging to the coal formation begins to appear and covers the greater part of Transylvania. Tertiary formations surround the vast plains of Hungary, which consist of a rich alluvium and must once have been the bed of a lake. Basalt frequently occurs, but no distinct traces of extinct volcanoes have been found. The Carpathian range is rich in minerals, including gold, silver, lead, quicksilver, copper and iron. Salt occurs in beds which have sometimes a thickness of 600 or 700 feet and are apparently inexhaustible. On the plateaus corn and fruit are grown to the height of 1,500 feet; higher up the mountain steeps are covered with forests of pine, oak, beech, chestnut and fir, some of them as high as 5,500 feet. Bears, lynxes and wolves are numerous in the forests. About 6,000 feet seems to be the vegetable limit. Above it a few lichens may be found, but in general nothing is seen but bare, steep rocks, many of them in the form of conical peaks. There are no glaciers nor perennial snow fields. Numerous passes across the system facilitate communication between Hungary and her neighbors to the east. See HUNGARY; GALICIA; RUMANIA.

CARPATHOS, kär'pa-thŏs, an island in the Ægean Sea, now called Scarpanto. In ancient times it belonged to Rhodes. It has been under Italian rule since 1912. It is situated midway between the island of Rhodes and Crete. It is 31 miles long and 8 miles in extreme breadth. Area 126 square miles. It has bare mountains, reaching a height of 4,000 feet. There are ruins of towns in several places. Pop. about 8,000, mostly Greek workers in wood and fishermen.

CARPEAUX, Jean Baptiste, zhŏṅ bäp'tēst kär-pō, French sculptor: b. Valenciennes, France, 14 May 1827; d. Courbevoie, near Paris, 12 Oct. 1875. He studied at the School of Architecture in Valenciennes, and later went to Paris, becoming a pupil of Rude and of Duret. In 1854 he obtained the Prix de Rome. His bronze 'Neapolitan Boy' attracted notice; and 'Ugolino and His Four Sons' (1863), also in bronze, though it defied the canons of sculpture, made him famous. He settled in Paris in 1862. His masterpiece, a marble group, 'The Dance,' in the façade of the New Opera in Paris, fully showed his dramatic power and the exuberance of his imagination; but it provoked much hostile criticism as involving an attempt to stretch beyond their natural province the limits of the plastic art. The most notable of his later works are the great fountain in the Luxembourg Gardens, representing 'Four Quarters of the World Sustaining the Sphere'; a monument to Watteau at Valenciennes, and a painting of 'Napoleon in His Coffin' in the same museum. For his originality and virility he has been ranked with Rodin, Rude and David d'Angers. In painting he exhibited the same fearless handling of theme. Paris contains several thousand of his drawings; the Louvre possesses many of these as well as notable portrait busts of Alexandre Dumas fils, Napoleon III and the Princess Mathilde. Consult biographies by Claretie (Paris 1875); Chesneau (ib. 1880). Consult also Gonse, 'La sculpture française' (ib. 1895).

CARPEL, the leaf forming the pistil. Several carpels may enter into the composition of one pistil. See FLOWER.

CARPENTARIA, Gulf of, a large gulf indenting the northern coast of Australia, named for its discoverer, Pieter Carpenter. Cape York Peninsula, the northern extremity of Queensland, is on the east and Arnhem Land on the west. It contains a number of islands, among them Groote Eylandt, Sir Edward Pellew Islands and Wellesley Islands. Its maximum width is about 400 miles and its length 460 miles, stretching from lat. 11° to 17° 30' S. and from long. 136° to 142° E. The land around is generally low.

CARPENTER, Charles Carroll, American naval officer: b. Greenfield, Mass., 27 Feb. 1834; d. Jamaica Plain, Mass., 1 April 1899. He was promoted commodore 15 May 1893 and rear-admiral 11 Nov. 1894; was commander-in-chief of the United States Asiatic squadron from 27 Aug. 1894 till 9 Nov. 1895; and was retired on reaching the age limit, 28 Feb. 1896. During the summer of 1895 he rendered invaluable service in China in protecting American missionaries and in co-operating with United States Minister Charles Denby and the British and Chinese authorities to preserve peace, particularly after the Kucheng massacre.

CARPENTER, Edmund Janes, American journalist: b. North Attleboro, Mass., 16 Oct. 1845. After graduation from Brown University in 1866 he engaged in business until 1878, when he entered journalism. He was for many years on the editorial staffs of Providence, New Haven and Boston papers, and is contributing literary reviewer to the Boston *Transcript*. He has published ‘A Woman of Shawmut: a Romance of Massachusetts Bay Colony, 1640’ (1892); ‘America in Hawaii’ (1898); ‘The American Advance’ (1903); ‘Long Ago in Greece’ (1906); ‘Roger Williams’ (1909); ‘The Pilgrims and their Monument’ (1911); ‘Memoirs and Letters of James Kent, LL.D.,’ in collaboration with William Kent; is also the author of many editorials, newspaper articles, literary reviews, translations and verses. In 1905 he received the degree of Litt.D. from Brown University.

CARPENTER, Edward, English socialistic writer: b. Brighton, England, 20 Aug. 1844. He was educated at Trinity Hall, Cambridge, and was for some time fellow and lecturer there, as well as curate under the noted F. D. Maurice. In 1874 he gave up his fellowship and left the ministry, and until 1881 lectured on science and music in university extension work. He has since devoted his time to literary work, market gardening and socialist propaganda. In 1884 he visited the United States in order to meet Walt Whitman. He has published ‘Towards Democracy’; ‘Love's Coming of Age’; ‘Angels' Wings’; ‘Adam's Peak to Elephanta’; ‘Iolaus: an Anthology of Friendship’; ‘Days with Walt Whitman’; ‘The Drama of Love and Death’; ‘The Healing of Nations,’ etc.

CARPENTER, Francis Bicknell, American painter: b. Homer, N. Y., 6 Aug. 1830; d. New York, 23 May 1900. He studied with Sanford Thayer at Syracuse, N. Y. (1844), and in 1852 became an associate of the National Academy. Among his works are a portrait of President Fillmore, in the City Hall, New York; a portrait of President Lincoln, in the capitol at Albany, N. Y.; and the ‘Emancipation Proclamation’ (1864), in the capitol at Washington. While executing the last-named painting he was closely associated with President Lincoln, and his observations during this period are embodied in his book entitled ‘Six Months in the White House with Abraham Lincoln.’

CARPENTER, Fred Warner, American diplomat: b. Sauk Centre, Minn., 12 Dec. 1873. He received a public school education, studied law at the University of Minnesota, in 1898 was admitted to the bar and was stenographer to a law firm for several years. He became private secretary to William H. Taft, governor of the Philippines in 1901, continuing while Mr. Taft was Secretary of War and during part of his term as President. He was appointed Minister to Morocco in 1910, and 1911–13 was Minister to Siam.

CARPENTER, Joseph Estlin, English Unitarian scholar: b. Ripley, Sussex, 5 Oct. 1844. He was educated at University College, London, and Manchester New College (now at Oxford). He was minister of Oakfield Road Church, Clifton, 1866–69, and of Mill Hill Chapel, Leeds, 1869–75; was lecturer in Manchester New College, 1875–1906, and principal, 1906–15. He is one of the very foremost living authorities as a Sanskrit scholar and biblical critic, and besides editing Ewald's ‘History of Israel’ (Vols. III–V) and translating Tiele's ‘Outlines of the History of Religion,’ is the author of ‘Life and Work of Mary Carpenter’ (1879); ‘Life in Palestine’; ‘The First Three Gospels: Their Origin and Relations’ (1890); ‘The Bible in the Nineteenth Century’ (1903); ‘James Martineau, Theologian and Teacher’; ‘The Historical Jesus and the Theological Christ’; ‘Comparative Religion’ (1913). With Rhys Davids he has edited the ‘Sumairgala Vilasini’ (1886); and the ‘Digha Nikaya’ (1889). With Harford-Battersby he has also edited the Hexateuch according to the revised version.

CARPENTER, Lant, English Unitarian clergyman: b. Kidderminster, 2 Sept. 1780; d. at sea, 5 April 1840. Designed for the ministry, he was sent in 1797 to the Northampton Academy. That school being temporarily discontinued, young Carpenter was placed at Glasgow College, where, however, he did not continue the length of time necessary to take his degree. Leaving college in 1801, he spent some time in teaching, and as librarian of the Athenæum, Liverpool. At Liverpool, Carpenter's views were so clearly in sympathy with those of the Unitarian denomination generally that he received several invitations to the pastoral charge of Unitarian congregations, and a call to a professorship in their college at York. In 1805 he accepted a call to Exeter, where he continued for 12 years. In 1806 the University of Glasgow gave him the degree of LL.D., although he had applied only for the degree of M.A. From Exeter he removed to the pastoral charge of the Unitarian congregation at Bristol (1817), where he continued until his death, which occurred by falling from a vessel between Naples and Leghorn, while on a tour for his health. Dr. Carpenter's piety was of an eminently practical turn. The instruction of children was an object of constant interest. Amid all his pastoral and literary labors he always found time and energies to devote to juvenile instruction, and, even against the prejudices of his congregations, established Sunday-schools among the children of Exeter and Bristol. In his pastoral charges at Exeter and Bristol he was active in co-operation with others in the establishment of libraries, schools, savings banks and institutions for general improvement and welfare. His published works are mainly theological and doctrinal, in support of the Unitarian sentiments he had early espoused. Among his more important works are 'An Introduction to the Geography of the New Testament'; 'Unitarianism, the Doctrine of the Gospel' (1809); 'Examination of the Charges Against Unitarianism' (1820); 'Harmony of the Gospels'; 'Systematic Education' (2 vols., 1815); 'Principles of Education' (1820); and a volume of sermons. Mild in controversy, faithful in humane labors and practically devoted to the improvement of society, Dr. Carpenter was greatly respected even by those who were his most staunch antagonists in theology. Consult his 'Memoirs,' edited by his son, R. L. Carpenter (London 1842).

CARPENTER, Louis George, American engineer: b. Orion, Mich., 28 March 1861. He was graduated at Michigan Agricultural College in 1879, and after serving there as instructor in mathematics and engineering took post-graduate courses at the University of Michigan and Johns Hopkins University. In 1888 he became professor of engineering at the Colorado Agricultural College and meteorologist and irrigation engineer at the Agricultural Experiment Station, and organized the first systematic course in irrigation engineering given in any American college. He founded the American Society of Irrigation Engineers in 1891. He was special agent of the United States artesian wells investigation in 1890, and in 1899 was appointed director of the Agricultural Experiment Station at the Colorado Agricultural College. He is a member of many American and foreign engineering societies. He has published government reports, 'Artesian Wells in Colorado' (1890); 'Irrigation Progress in Colorado' (1891); and many papers on irrigation.

CARPENTER, Margaret Sarah, English painter: b. Salisbury, England, in 1793; d. London, 13 Nov. 1872. Her first studies in art were obtained from the collection of Lord Radnor at Longford Castle, and later she competed for several years for the prizes offered by the Society of Arts, several times successfully, and once being awarded the gold medal for the study of a boy's head. In 1814 she went to London, where she secured for herself a wide reputation as a portrait painter; in that year her exhibits of a portrait of Lord Folkestone at the Royal Academy and the pictures 'Fortune-Teller' and 'Peasant Boy' at the British Institution at once gained for her great popularity and marked the beginnings of her rapid rise. In 1866 upon the death of her husband, W. H. Carpenter, keeper of the prints and drawings in the British Museum, she was granted by the Queen an annual pension of £100. Between the years 1816-66 she exhibited 147 pictures at the Royal Academy, 50 at the British Institution and 19 at the Society of British Artists. Chief among her pictures are 'Lord Kilcoursie and Lady Sarah de Crespigny' (1812); 'Lord Folkestone' (1814); 'Mr. Barring' (1815); 'Sir Henry Bunbury' (1822); 'Lady Eastnor' (1825); 'Lord de Tabley' (1829); 'Justice Coleridge' (1830); 'Lady Denbigh' (1831); 'Mrs. Herries' (1832); 'Lady King, daughter of Lord Byron' (1835); 'Archbishop Sumner' (1852), etc. In the National Portrait Gallery are also three portraits from her brush — those of Richard Parkes Bonington, the painter; John Gibson, the sculptor; and Patrick F. Tytler, the historian. In the South Kensington Museum are three pictures: 'Devotion' (1822); 'The Sisters' (1840); and 'An Old Woman Spinning.' Consult Clayton, E. C., 'English Female Artists' (Vol. I, pp. 386-88, 1876).

CARPENTER, Mary, English philanthropist; b. Exeter, 3 April 1807; d. Bristol, 15 June 1877. She was the eldest daughter of Lant Carpenter (q.v.). Her special work was for the neglected children of the poor and young criminals. She established a number of schools and reformatories, including the Red Lodge, a girls' school at Bristol, of which she was superintendent. She visited India in 1866, 1868, 1869 and 1875; and came to the United States and Canada in 1873, where she spoke on prison reform. She wrote 'Reformatory Schools for the Children of the Perishing and Dangerous Classes' (1851); 'Juvenile Delinquents' (1853); 'Our Convicts' (1864); and 'Six Months in India' (2 vols., 1868). Consult Carpenter, J. E., 'Life of Mary Carpenter' (London 1879).

CARPENTER, Rolla Clinton, American engineer: b. Orion, Mich., 26 June 1852. He studied at the Michigan Agricultural College, M.S., LL.D.; was graduated at the University of Michigan in 1875; student Cornell, M.M.E., 1888; was professor at the Michigan Agricultural College, 1878-90; professor of experimental engineering, Cornell University, since 1890; member American Society Mechanical Engineers (vice-president; chairman Committee on Research); American Society Civil Engineers; American Society Mining Engineers; American Society Heating and Ventilating Engineers (president, 1898); Society Automobile Engineers (vice-president); consulting engineer for Helderberg Portland Cement Company, Cayuga Lake Portland Cement Company, Quaker Portland Cement Company, Great Northern Portland Cement Company, Belleville Portland Cement Company, Atlas Portland Cement Company, Kosmos Portland Cement Company, California Portland Cement Company and others; has constructed numerous power stations for electric railways and has had active charge of many engineering constructions; patent expert in several important cases; judge of machinery and transportation, World's Fair, Chicago, 1893, Pan-American Exposition, Buffalo, 1901, Jamestown Exposition, 1907; member of committee to report to President of United States respecting slides in Panama Canal 1915-16; author 'Experimental Engineering' (7 eds., 1890, 1902, 1909); 'Heating and Ventilating Buildings' (7 eds., 1898, 1902, 1909); and numerous papers in 'Transactions American Society Mechanical Engineers,' 'Transactions Heating and Ventilating Engineers,' etc.

CARPENTER, William, English editor and author: b. Saint James, Westminster, 1797; d. Colebrooke Row, Islington, 21 April 1874. Being the son of a poor tradesman he was put to work early in life and obtained no education, but entering the service of a bookseller he soon learned to speak fluently several ancient and modern languages, and took great interest in the study of biblical subjects. With William Greenfield he edited the *Scripture Magazine,* which was later known as 'Critica Biblica' (4 vols., 1824–27); in rapid succession he became editor of *Shipping Gazette* (1836); *Era* (1838); *Railway Observer* (1843); Lloyd's *Weekly News* (1844); *Court Journal* (1848); *Sunday Times* and *Bedfordshire Independent* (1854). He issued a publication 'Political Letters' (1830–31), which he claimed was not liable to the stamp duty on newspapers, but at his trial in 1831 was convicted and imprisoned for some time. Carpenter wrote many treatises on the subject of political reformation and from 1851–53 was honorary secretary to the Chancery Reform Association. Among these works are 'The Elector's Manual' (1832); 'The Political Text-book' (1833); 'Peerage for the People' (1841); 'The Corporation of London as it is and as it should be' (1847). Of his other publications the most noteworthy are 'Sancta Biblica' (1825); 'Anecdotes of the French Revolution of 1830' (1830); 'Life and Times of John Milton' (1836); 'The Biblical Companion' (1836); 'Relief for the Unemployed: Emigration and Colonization Considered' (1841); 'A Comprehensive Dictionary of English Synonyms' (6th ed., 1865); 'An Introduction to the Reading and Study of the English Bible' (3 vols., 1867–68), etc.

CARPENTER, William Benjamin, English physiologist and naturalist: b. Exeter, 29 Oct. 1813; d. 19 Nov. 1885. He was the eldest son of Lant Carpenter (q.v.); was educated in his father's school at Bristol, and in 1833 entered University College, London, as a medical student. Two years later he went to Edinburgh University, where he was graduated as M.D. in 1839; and in that year also he produced his first important work, 'The Principles of General and Comparative Physiology.' In 1844 he was elected a fellow of the Royal Society and also obtained the Fullerian professorship of physiology at the Royal Institution. From 1847 to 1852 he was editor of the *British and Foreign Medico-Chirurgical Review,* was one of the editors of the *Natural History Review,* and in 1856 he was appointed registrar of the University of London, a post which he resigned in 1879. He wrote several well-known works on physiology, one of which has been already referred to. Others are 'Principles of Mental Physiology' (4th ed., 1876) and 'Principles of Human Physiology' (1846, new edition by H. Power 1881). Still other works of his are 'Introduction to the Study of the Foraminifera' (1862); 'The Microscope and Its Revelations' (1868; 6th ed., 1881); 'The Physiology of Temperance and Total Abstinence' (1853); 'Zoology and the Instincts of Animals' (1857); 'Mesmerism and Spiritualism' (1877); 'Nature and Man' (1888); besides many papers in scientific journals. He took a leading part in the expeditions sent out by the government in 1868–70 for deep-sea exploration in the north Atlantic and contributed largely to the discussion of ocean circulation. He advocated the doctrine of vertical circulation independently of Dr. Lenz of Saint Petersburg, who in 1845 had begun to advance that theory. He was chosen president of the British Association at Brighton in 1872.

CARPENTER, William Henry, American philologist: b. Utica, N. Y., 15 July 1853. He received a university education at Cornell and Johns Hopkins, and at Leipzig and Freiburg universities; became instructor in rhetoric and lecturer on North European literature in Cornell University in 1883; instructor of German and Scandinavian languages in Columbia University, 1883–89; assistant professor of Germanic languages and literature in the same institution, 1889–90; adjunct professor, 1890–95; and in 1895 professor of German philology there. Since 1912 he has been provost of the university. He is vice-president of the Germanistic Society of America and editor of the *Germanistic Society Quarterly;* and trustee and secretary of the Columbia University Press. He is a member of the Authors and Century Clubs of New York. He has published several works in the line of his specialty, and has contributed largely to dictionaries and encyclopædias and to magazines and reviews.

CARPENTER-BEE, a species of bee (*Xylocopa virginica*) which burrows into dead tree-trunks, lumber and even into woodwork of buildings. It is a large, black-bodied bee, as big as the biggest bumblebee. Its burrow is about half an inch in diameter, runs horizontally across the grain of the wood for a short distance, then forms a tunnel at right angles to this entrance, running sometimes 12 to 18 inches. When the tunnels are complete, the cells are made and supplied with pollen. The cells are about seven-eighths of an inch long, and are separated from each other by partitions made of sawdust glued together. When the eggs, which are laid one in each cell, are hatched, the larvæ feed on the pollen-deposit until they are ready to bore their way out. The carpenter-bee will use the same burrow again and again, and its home is sometimes utilized by other species of bees.

CARPENTERS' HALL, Philadelphia, on the south side of Chestnut street between Third and Fourth. It was built shortly after 1770 (as an assembly house and club) for the carpenters' guild of that city, and probably for civic uses if desired. In 1774 it became famous as the chosen meeting-place of several conventions for the liberation of the colonies. The first was on 15 July, when the committee of correspondence of the colony appointed a session of committees from each county, as "the most effective means toward a union." Later, on 5 September, the first Continental Congress met in its "plain but spacious rooms" on the lower floor, although the State House had been offered them. Behind its closed doors were prepared the papers which Chatham said ranked with the greatest of the world. The second Congress also began its sessions there, 10 May 1775.

CARPENTRAS, kăr-păṅ-trä, France, a town of the department of Vaucluse, situated 16 miles northeast of Avignon. In Roman times it was known as Carpentoracte, was a place of importance and possessed many handsome edifices, of which a few traces are left. The principal structures are an aqueduct, which crossed the valley of the Auzon by 48 arches; a Roman triumphal arch, a Gothic cathedral, a museum containing a collection of Phœnician bas-reliefs and the library containing 50,000 volumes. Carpentras has a considerable local trade, and weekly markets, which are among the most important in southern France. It was formerly the seat of a bishopric, and Pope Clement V had his residence there in 1313. The chief products are leather, wax, chemicals and fruit. It has also a considerable trade for its manufactures of silk, dyed fabrics and hats. Pop. 11,390.

CARPENTRY, the art of combining pieces of timber to support a weight or sustain pressure. The work of the carpenter is intended to give stability to a structure; that of the joiner is applied to finishing and decoration. The scientific principles of carpentry are founded on the doctrines of the composition and resolution of mechanical forces, and a knowledge of these doctrines, either theoretical or practical, is indispensable to the skilled carpenter. To go into the principles of the art would be merely to explain a particular application of these mechanical forces, which would be beyond the scope and limits of this work. An explanation of the terms employed in carpentry may, however, be useful to the general reader. The term «frame» is applied to any assemblage of pieces of timber firmly connected together. The points of meeting of the pieces of timber in a frame are called «joints.» «Lengthening» a beam is uniting pieces of timber into one length by joining their extremities. When neatness is not required this is done by «fishing.» In this mode the ends of the beams are abutted together, and a piece of timber placed on each side and secured by bolts passed through the whole. Sometimes the parts are indented together, and pieces termed «keys» are notched into the beams and side pieces. When it is desirable to maintain the same depth and width throughout the beam, «scarfing» is employed. This is cutting from each beam a part of the thickness of the timber, of the length of the intended joint, and on opposite sides, so that the pieces may be jointed together and bolted or hooped. In bolting scarfs, side plates of iron are used to protect the wood. When greater strength is required than can be produced by a single beam, «building» and «trussing» beams are resorted to. Building beams is combining two or more beams in depth so as to have the effect of one. In trussing the beam is cut in two in the direction of its length, and supported with cross-beams, as in roofing. «Mortise» and «tenon» is a mode of jointing timber. An excavation called a mortise is made in one piece and a projecting tongue to fit it, called a tenon, in the other. The tenon is confined in the mortise by a pin penetrating it laterally through the side of the mortised beam, or by an external strap of iron passing round the mortised beam and rivetted in the one terminating in the tenon. The timber frame-work of floors is called «naked flooring.» It is of three kinds — single, double and framed. Single flooring consists of a series of joists stretching across the whole void from wall to wall, without an intermediate support. The flooring boards are laid on the top of these, and the ceiling of the lower story fixed to the under side. Double flooring consists in laying binding joists across the floor about six feet apart, crossed above by bridging joists and also crossed below by the ceiling joists. Framed flooring is provided with girders or beams in addition to the binding, bridging and ceiling joists. To prevent the transmission of sound, a double ceiling of lath and plaster is sometimes used, but generally pugging is inserted between the roof and the ceiling. «Cornice bracketing» consists in rough wooden profiles of the room cornices, which are afterward lathed around and plastered. Partitions, when not required to bear weight, are formed by laying along the floor a piece of timber called a «sill,» together with a corresponding piece along the ceiling joists, the space within being filled with vertical pieces called «quarters,» to which the lath is nailed. When the partition has weight to support, it has to be trussed with posts and braces. The timbers which support the steps of a wooden staircase are termed the «carriage.» They consist of two pieces of timber inclined to the «rake,» or projection of the steps, and termed «rough strings,» which may rest upon a piece of timber projecting horizontally from the upper wall, called a «pitching» or «apron» piece, which also supports the joists of the landing or «half pace.» The «roof» is the framework by which the covering of a building is supported. It may consist of a series of timbers which are called «rafters» with the ends resting on the opposite walls, and the other ends meeting in a point. When loaded with the weight of the covering, this framework would be apt to thrust out the roof; a third piece is consequently added, which, like a string, connects the lower extremities of the rafters and prevents them from spreading. This is called a «tie,» and the whole frame a «couple.» When the tie is of such a length that it is apt to droop in the middle, or «sag,» by its own weight, a fourth piece is added to unite it directly with the apex of the rafters; this is called the «king-post.» If the rafters, too, are liable to sag, cross pieces called «struts» are introduced, uniting their centres with the centre of the tie. Instead of the king-posts and struts, the centre of each rafter may be joined to the tie by a piece falling perpendicularly on the latter, and to each other by a piece running across parallel to and above the tie, forming a parallelogram with the perpendiculars and the section of the tie enclosed by them. The suspending pieces are called «queen-posts,» and the horizontal one a «collar-beam.» The whole frame, constructed in either way, is called a truss. The trussed frames are placed at intervals of about 18 feet apart, and support horizontal pieces called «purlins,» which run the whole length of the roof and support the common rafters with their covering. Ship carpentry is a special form of carpentry. The timbers are larger and heavier and of the harder kinds of wood. These must be shaped to the curved lines of the vessel and properly beveled to make close joints. This branch of carpentry is now confined to small vessels such as yachts, coasting schooners, barges, scows, etc.

The principal instruments used in carpentry are saws, as the circular-, band- and tenon-saws; planes, as the jack-plane, smoothing-plane, molding-plane, etc.; chisels, gouges, brad-awls, gimlets, descriptions of which will be found in their places. See BUILDING; CABINET-MAKING; JOINERY; SHIPBUILDING.

Bibliography.— Fletcher and Fletcher, 'Carpentry and Joinery for Architects, etc.' (London 1898); Hatfield, 'The American House Carpenter' (New York 1880); Hodgson, 'Modern Carpentry and Joinery' (ib. 1906); Jacoby, 'Structural Details, or Elements of Design in Heavy Framing' (ib. 1909); Riley, 'Manual of Carpentry and Joinery' (ib. 1906).

CARPET (Lat. *carpere*, to «pluck» or «card,» as wool), a thick woolen fabric used for covering floors. The word originally meant (in old French) a coarse cloth in which packages were wrapped for packing upon the backs of men and animals. As man advanced in civilization and desire for comfort, he began to use his packing *carpite* as a wrap for himself and to cover his feet and limbs at night. From that he began to use it to protect his sandaled feet from cold stone floors. Then the material was made finer and gradually embellished with colors and designs. The art progressed most rapidly in the cold mountain districts of western Asia — Persia, Turkey, Syria. The people of these regions had time, patience and a love for things beautiful. They produced wonderful results with wool, camel's hair, or goat's hair, combined with a flaxen warp. All their work was (and still is) done most laboriously by hand on looms of the crudest sort. These fabrics of the better sort are almost indestructible with ordinary wear. Carpets are still in use in some of the palaces of Persia which have been constantly used since the end of the 16th century.

When woven floor-coverings were first used by man is hard to tell. Fragments of what might be such are found in Egyptian excavations indicating a possible use of them as early as 3000 B.C. That the skins of animals and rush mats were used by prehistoric man as protection from the cold stone of the cave dwelling is certain. Cyrus the Great had wonderful carpets when he placed Persia at the forefront of nations. Alexander found them in use in his victorious march through Asia to India.

The art of carpet-making in its best sense still remains with the Orient. No Occidental possesses the matchless patience properly to weave by hand the marvelous creations of the Far East. Some of the Indian carpets approach the fineness of those of Persia. The jute and cotton rugs of Japan, and the grass mattings of China, are samples of this art in poorer material.

In the United States there are samples of native workmanship which compare well with the productions of the East. The work of the Navajo Indian in particular is very quaint and perfect. His rugs or blankets, colored with native pigments and laboriously woven by hand, will wear for many years. Cortez found the palaces of Montezuma covered with grand rugs, many of them made of the skins of humming-birds sewn together. See CARPET AND RUG INDUSTRY.

CARPET-BAGGERS, CARPET-BAG GOVERNMENTS. The admission of the Southern negroes to the franchise after the war involved their organization and leadership, and their representation in State and national offices by intelligent whites. As no Southern whites of character would undertake what they regarded as a crusade against civilization, the task fell to Northern Republicans. Those who undertook it were of all grades of personal integrity and honesty of purpose, from sincere old-fashioned abolitionists to mere scalawag adventurers; but they had one characteristic in common: the lack of property interests in the South to make its injury theirs. Hence the name, implying that their only possessions were in their carpet-bags. The name was at first given only to those whose one motive for residence there was election to office by aid of the negro vote; and the purpose of many was voiced in the utterance of one high official, that when he could no longer hold office from there he would no longer live there. But the régime of monstrous plunder and social and industrial ruin which the system brought on, the levying of fraudulent taxes, and the piling up of huge State debts for the future, soon effaced all distinctions. All Northerners who upheld the system or tried to protect the negroes' voting rights were confounded under the name; all State governments in any way protected from overthrow by United States troops were «carpet-bag» governments; and finally the entire years of Reconstruction, and that attempt itself, are compendiously known as the «Carpet-Bag Régime.»

CARPET-BEETLE, a small beetle (*Anthrenus scrophulariæ*), often wrongly called «buffalo bug.» In the grub or larval state, it is injurious to carpets and similar fabrics. It is an active, brown, hairy larva, the size of a grain of wheat, which works in a hidden manner from the under surface, sometimes making irregular holes, but more frequently following the floor-cracks and cutting long slits in a carpet. This insect was brought from Europe about 1874, and is abundant in the New England States and westward to Kansas. The adult insect is a minute, broad-oval beetle, about three-sixteenths of an inch long, with a red stripe down the middle of the back. When disturbed it folds up its limbs and feigns death. As a general thing the beetles begin to appear in the autumn, and continue to issue, in heated houses, throughout the winter and following spring. Soon after issuing they pair, and the females lay their eggs in convenient spots. The eggs hatch in a few days, and the larvæ develop rapidly. Their development is retarded by cold weather or by lack of food, and they may remain alive for an indefinite period. When, under normal conditions, the larva reaches full growth, the yellowish pupa is formed within the last larval skin, from which the beetle emerges later. The beetles are day-fliers, and when not engaged in egg-laying are attracted to the light. They fly to the windows, and may often be found upon the sills or panes. The carpet-beetle is very difficult to exterminate, and the best preventative is the use of movable rugs on hard-wood floors. Suspected carpets should be taken up, beaten, sprayed out of doors with benzine, and then be well aired. Before relaying the carpet, tarred roofing-paper should be laid upon the floor.

Another similar pest is the black carpet-beetle (*Attagenus piceus*), whose larva is readily distinguished from the buffalo-bug by its cylindrical shape and lighter color. It is not so fond of working in cracks and cutting long slits in carpets, and in general is not so dangerous a species as the other. It sometimes produces in feather-beds a peculiar felting of the ticking. It has also been known to infest flour-mills, and is to a certain extent a feeder upon cereal products. Two years are required for its development from egg to beetle. Consult Howard and Marlett, 'Household Insects' (United States Department of Agriculture, Washington, 1896).

CARPET AND RUG INDUSTRY. Like many American industries, the manufacture of carpets had its beginnings in the Old World.

Probably the first carpetings made on a large scale were made in an establishment founded by Henry IV, King of France, at the Louvre in 1607. This establishment was followed in 1627 by one called the «Savonnerie» at Chaillot, the building having previously been used as a soap factory, and by one at Beauvais, established in 1664 by Colbert, minister of Louis XIV. Many of the weavers employed in these factories were Protestants and the revocation of the Edict of Nantes in 1685 caused a tremendous emigration of these people to other countries, more particularly to England, Holland and Flanders. Thus in England in 1735 we find that in the town of Kidderminster the manufacture of ingrain carpetings had been established, and although carpet-making had been attempted as far back as the reign of Edward III at Bristol, it did not gain a permanent foothold in the country until after the immigrations from France. In 1745 the Earl of Pembroke established a factory at Wilton in which he employed only French weavers, and this was followed in 1750 by an establishment founded at Fulham by a Capuchin friar for the manufacture of Savonnerie carpetings, but this was a failure.

The manufacture of Brussels carpet was introduced into England from Flanders, where it undoubtedly originated, by John Broom, who put the first loom into operation in 1749. This loom, though the secret of its operation was carefully guarded, was copied, and within a short time there was a number of similar looms in operation, and so successful were the makers of this kind of carpet that Kidderminster rapidly became the centre of trade for this class of goods.

With the opening up of trade with the colonies, the carpet manufacturers of the Old World began to look westward for new markets, and along with the early settlers came men who had learned the art of weaving and were seeking new fields in which their energies might have full sway.

Of the early carpet dealers in this country the first records are meagre, but in Parker's New York *Gazette*, issue of 30 June 1760, an advertisement appeared reading as follows: «J. Alexander and Company have removed their store to Mr. Kayne's house on Smith Street, where Mr. Proctor, watch-maker, lately lived, where they sell check handkerchiefs, linens of different kinds, lawns and minonets, Scot's carpets, broad and narrow cloths, shoes of different kinds, undershirts, hats, stockings, with several other goods; Fine Scot's barley and herrings. Also a choice parcel of Old Madeira in pipes.» Thus we see that carpets were sold in this country as early as the middle of the 18th century, but the manufacture did not commence until many years after the introduction.

The history of carpet-making in America may be divided into two periods, the first covering the times when all carpets were made on hand looms, and extending up to the year 1841, when the perfected power loom was introduced; the second period extending from 1841, when Erastus B. Bigelow of Boston, Mass., brought forth his perfected power loom and completely revolutionized the methods of carpet-making, up to the present time.

The earliest records show that W. P. Sprague was the pioneer in the weaving of carpets, and in 1791 opened a factory in Philadelphia for the manufacture of Axminster carpeting. It was the importation of this style of carpet that first suggested the principle of the protective tariff duty. At the time Alexander Hamilton, as Secretary of the Treasury, transmitted a message to the House of Representatives in which he recommended that a duty of 2½ per cent be laid on all imported carpets «to which the nature of the articles suggests no objection, and which may at the same time furnish a motive the more to the fabrication of them at home, toward which some beginnings have been made.» This factory was followed in 1804 by one at Worcester, Mass., owned by Peter and Ebenezer Stowell, in which were six looms invented and constructed by themselves.

The manufacture of ingrain carpets in this country was begun early in the 19th century, the first ingrain mill probably being that established in 1810 by George M. Conradt, a native of Würtemberg, Germany, at Frederick City, Md. There carpets were made on a hand loom, on a drum having rows of pegs similar to the cylinder of a music box, by which the harness was worked. In 1821 a factory was established in New York by John and Nicholas Haight, with J. W. Mitchell, a Scotchman, who had come from Kilmarnock, the centre of the ingrain trade in Scotland, as superintendent. In 1825 Alexander Wright, who was the superintendent of a factory at Medway, Mass., owned by Henry Burdette, attempted to learn the processes of the Jacquard system, but was unable to gain any knowledge of them because the secrets were so jealously guarded that he was not even permitted to enter the mill. He thereupon went to Scotland, and after purchasing the best hand looms on the market and securing mechanics to operate them, returned and started the manufacture of carpets on a scale which for those times was very extensive. The factory was in 1828 sold complete to the Lowell Manufacturing Company, the machinery and looms being transferred to their new mill in Lowell upon its completion. Alexander Wright was the first superintendent of this mill, and together with Claude Wilson, one of the mechanics whom he had brought with him from Scotland, devised many improvements in the Jacquard loom, making it simple in construction, eliminating the more complex parts in the machinery, and making the operation more easy and certain. Of course these looms did not reach a state of perfection till many years afterward, and the machinery was so expensive, the operation so tedious, and the skill required so great, in the making, that it was thought the demand for carpets would not justify such an outlay, but through perseverance and the gradual introduction of improved methods the efforts put forth by the Lowell company were amply repaid, and the founders lived to see the establishment become one of the largest carpet factories in the country.

In 1840 the carpet industry was started in New York by Robert Beattie, followed in 1841 by E. S. Higgins and Company, who engaged in the manufacture of ingrain carpetings. In 1844 Alexander Smith started a factory at West Farms, N. Y. In 1845 John Bromley commenced to manufacture in Philadelphia and was practically the pioneer in what has grown to be the largest manufacturing centre of the country; where more yards of carpet of all grades are made than in any other city in the world, and where some of the finest factories in the world are located.

At this period the manufacture of carpet in this country was far from being a large industry. In Massachusetts there were seven factories in operation; in Connecticut there were four; in New York, eight; in New Jersey, four; Maryland had one; and in Pennsylvania there were only five, all of which were in or near Philadelphia. Of the total number of looms then in operation, 1,500, probably not more than 1,250 were used for ingrains, the others being used for the manufacture of Brussels, damasks, Venetian or rugs. The largest mills then were: The Lowell company, operating 150 looms; W. H. McKnight, Saxonville, Mass., 150 looms; Orrin Thompson, Thompsonville and Tariffville, Conn., 250 looms; and W. H. Chatham, Philadelphia, 160 looms, while numbered among them were the first plants of such concerns as the Hartford Carpet Company, Robert Beattie and Sons, E. S. Higgins Carpet Company and McCallum and McCallum.

It was in 1841 that the second period in the history began. Erastus B. Bigelow (q.v.), a young medical student in Boston, 20 years of age, in 1839 became interested in the weaving of coach-lace, and started in to improve on the machinery, by which this class of goods was made, with the result that inside of two years he had brought forth an invention by the use of which the cost of the manufacture of these goods, which had been 22 cents a yard, was reduced to three cents. The same year he introduced a power loom for weaving ingrain carpets, raising the product of eight yards a day possible on the hand loom to 10 or 12 yards, and later, after making several improvements, extending this total to 25 or 27 yards a day. He also invented and patented the power loom for weaving Jacquard Brussels, Wilton and tapestry carpets. He was, however, unable to interest any of the manufacturers in his inventions and finally started a plant of his own at Clinton, Mass., and which was later organized as the Bigelow Carpet Company, now one of our greatest and most progressive companies. The exclusive right to use his process of manufacture in England was at once purchased by the Crossleys of England and A. & E. S. Higgins of New York, and the Roxbury Carpet Company of Massachusetts acquired the use in the United States of his loom for tapestry and velvet during the term of the patent.

To John Johnson of Halifax, England, belongs the credit of first manufacturing tapestry Brussels and velvet carpetings in this country. He began operations at Newark, N. J., in a mill with 25 looms, but this later was moved to Troy, N. Y., and in 1855 was purchased by the Roxbury Carpet Company and moved to Roxbury, Mass. The product of these looms originally was 5 yards per day; in 1856 it had advanced to 16 yards under the management of the Roxbury company, and now the average output per loom ranges from 60 to 65 yards, mainly possible through the introduction of the Bigelow inventions.

In 1856 Halcyon Skinner, a mechanic in the employ of Alexander Smith at his West Farms factory, began his investigations into the construction of a power loom with the intention of making one himself of superior capabilities, and the result of his labors was that about a year later his patent was brought forth, but owing to the destruction of the mill by fire it was not until 1864 that his loom was put into operation in the new factory which Smith had built at Yonkers, N. Y. In January 1877 Skinner invented his power loom for the manufacture of moquette carpetings and later several important improvements were made on this, not only by him but by his sons, Charles and A. L. Skinner. This increased the output of one and one-half yards a day, the result of the labors of two men and a boy, to about 11 yards a day, and this has gradually been increased till the output now reaches about 15,000,000 yards a year, made on 1,000 power looms and employing over 5,000 people.

Of the more recent inventions the most interesting is perhaps that of James Dunlap of Philadelphia, who patented a process of printing tapestry carpeting in the cloth, a marked improvement over all other previous methods because of the fact that the coloring matter was pressed down into the roots of the pile and extended entirely through the fabric.

The employment of power looms for making rugs is comparatively modern. The importation of Oriental hand-made rugs led to imitations being woven, and so successful was this branch of the industry that a large proportion of dwellings is now supplied with one-piece rugs in place of carpeting made in breadths.

Ingrain was the first machine-made carpet to be widely introduced. It was first manufactured as a two-ply cloth, with two colors of yarn, the pattern on one side appearing in reverse colors on the other side. Later a three-ply was made with concealed cotton string warp. No pile is used with either two- or three-ply. Ingrain has also been known as Kidderminster or Scotch, from the place of its origin.

Brussels, like most carpets, is made with a pile. This is a thick, hair-like surface given to a fabric, so that the weaving is covered. A cut pile leaves short, protruding ends, as in plush; an uncut pile leaves protruding loops. In Brussels the pile is uncut, being looped tight, these loops forming the pattern. The body fabric may be woven of linen, cotton or jute; dyed worsted is used for the pile.

Wilton carpets or rugs, sometimes known as imperial Brussels, and also velvet, are made similarly to Brussels, except that the pile is cut automatically in the loom during the process of weaving.

Axminster carpet, sometimes termed chenille Axminster, has a fluffy thick pile, with a linen or hemp warp and chenille filling. This chenille cord may be of worsted or other material, but its distinguishing characteristic is that it has four or more soft threads.

Tapestry carpet resembles Brussels, being really an imitation, more loosely woven, and having the warp-yarn forming the pile colored, or printed in the warp. Upon tapestry are built various tufted fabrics as moquette. Persian or Smyrna rugs have usually a linen or hempen warp and filling, and a pile or tufts of colored wool twisted about the warp. The Turkish rug is very similar, but the manner of attaching the tufts is different.

Rag carpet is a separate industry, carried on by a considerable number of very small concerns, mainly by some lone weaver, who has a suitable loom, and makes a living by weaving up the rags saved by economical housewives of the neighborhood. There are no statistics of the rag carpet industry.

In 1849 there were 116 establishments making carpets and rugs in the United States. They employed over 6,000 hands, and their product in that year was worth $5,400,000. In 1914 there were only 97 factories, but the volume of business had increased many times, and some of the factories, as in Philadelphia and Yonkers, are very large. The wage earners numbered 31,309, besides 1,720 salaried men. Nearly half the employees were women and children, and their average earnings were under $10 weekly. The salaried men averaged $33 weekly. The capital invested was $85,153,000, and the annual product was valued at $69,128,185, of which $25,847,962 was the value added by manufacture. The industry experienced its greatest growth during the decades from 1880 to 1890, and from 1900 to 1910, showing 50 per cent gain in each 10-year period specified. Pennsylvania was the leading State in the industry almost from its inception, but New York State was in the lead in 1914. Each of these States produces about one-third of the carpets and rugs manufactured in the country. Massachusetts was third with 16 per cent, and no other State made much showing. There are now about 12,000 carpet and rug looms in operation, and the annual yardage manufactured is close to 100,000,000.

Axminster and moquette carpets and rugs ranked first in respect to quantity produced in 1914, and also in respect to value. The output reported for that year was 15,742,835 square yards, valued at $18,578,693.

Tapestry Brussels carpets and rugs had the second largest output in respect to quantity, 13,614,354 square yards being produced, the decrease since 1909 being 20.3 per cent. In respect to value, however, this class of products occupied fourth place, being led by Axminster-moquette, tapestry velvet and Wilton.

Tapestry velvet carpets and rugs ranked third as to quantity and second as to value of output in 1914, and showed pronounced increases in both respects as compared with the 1909 figures. The production in the later year was 13,227,819 square yards, valued at $12,867,635, representing increases of 24.1 per cent in quantity and 42.5 per cent in value as compared with 1909.

Wilton carpets and rugs which ranked fifth in respect to quantity and third in respect to value in 1914, also showed pronounced gains, the output in that year amounting to 5,616,263 square yards, valued at $11,929,605, and representing increases of 5.1 per cent in quantity and 17.9 per cent in value over the corresponding figures for 1909.

The remaining products of the industry — consisting of body Brussels carpets and rugs, ingrain carpets and rugs, Smyrna rugs, Colonial or rag rugs, wool and paper-fibre rugs, other wool rugs, and other products — were valued at $15,899,605 in 1914. The production of body Brussels, ingrains and Smyrna rugs showed pronounced declines in 1914 as compared with 1909.

The chief constituent material of the carpet and rug industry is wool, either in raw or in partially prepared form. The raw wool used in 1914 amounted to 52,552,449 pounds and cost $10,493,743. Woolen and worsted yarns also constituted important materials. Of woolen yarn, 21,626,360 pounds, costing $5,821,848, was used; of worsted yarn 9,267,278 pounds, costing $4,592,906; of materials other than wool, yarn made of jute, ramie and other vegetable fibre is of greatest importance, the amount consumed being 59,148,266 pounds, costing $6,040,186; cotton yarn to the amount of 24,619,137 pounds, costing $4,637,673; and linen yarn amounting to 7,602,200 pounds, costing $1,414,824.

More than three-fourths of the mills purchased the yarn which they used in weaving carpets, there being only 22 establishments which bought the wool, hair or cotton, and themselves spun the yarn they consumed. These establishments produced, for their own consumption, 35,615,821 pounds of woolen, 10,253,791 pounds of worsted and 2,068,435 pounds of cotton yarn. Thus the total amount of woolen yarn used in the manufacture of carpets and rugs was 57,242,181 pounds; of worsted yarn, 19,521,069 pounds; and of cotton yarn, 26,687,572 pounds.

CARPET-SNAKE, the name of two different snakes, given in reference to the variegated pattern of their coloration. (1) An Australian python, about six feet long when fully grown, and beautifully marked, but subject to much variation. "The more typical specimens are black above, each scale with a yellowish dot, with yellow spots . . . more or less arranged in rows. The under parts are yellow." It is widely distributed and numerous in Australia, except in the northern deserts, and is now regarded as a variety (*variegata*) of the diamond python (*Python Spilotes*). In their habits they are quite alike. They frequent open, stony ridges, well supplied with water, or the banks of swamps and lagoons, where they find the small mammals and young waterfowls on which they feed; they also spend much of their time in trees. (2) A viper (*Echis carinatus*) of northern Africa, and southern Asia, buff in color, marked with whitish spots and dark Y-shaped marks on the head. It rarely exceeds two feet in length, but is very active and highly venomous, is semi-nocturnal in habits and causes the death of many persons annually, especially in southern India.

CARPET SWEEPERS. Carpet sweepers of a crude pattern were made in England hundreds of years ago, but not until 1876 was this device seriously considered as a time-saving, labor-saving household article. Several attempts had been made in this country as early as 1856 to produce a satisfactory carpet sweeper, but all fell short of the requirement. To Mr. M. R. Bissell is due the credit of producing the first carpet sweeper that did its work properly and satisfied the user, and millions of Bissell carpet sweepers are now in use throughout the world. It consists of a brush enclosed in a wooden or metal dustpan carried on four wheels, which also cause the brush to revolve. A later type is fitted with an air pump and in this the dust is drawn into the dustpan by suction as in the vacuum cleaner.

It is justly claimed for the carpet sweeper that it is at once the modern sanitary device for sweeping carpets and rugs; that it performs the work in one-quarter the time the corn broom requires and with 95 per cent less effort; that it raises no dust, thus protecting the furniture, draperies, bric-a-brac, etc.; that it confines all the dangerous germs within the pan receptacles, after which the contents can be burned or buried, thus promoting health and cleanliness at the same time.

The carpet sweeper has been constantly improved until to-day it is a thing of beauty as well as utility, and its use is recommended by the leading physicians of the world. As dust is admittedly a carrier of disease, it is clearly apparent that the sweeper is invaluable as a health-promoting appliance in the home, confining as it does all the dust and dangerous germs, to say nothing of its labor-saving, time-saving qualities. Where power or electric current is available the vacuum cleaner is fast displacing the early type of mechanical sweeper. In the vacuum cleaner the dust is drawn into a receptacle by suction. See VACUUM CLEANER.

CARPI, kär'pē, Italy, a town in the province of Modena and nine miles north of the city of Modena. It is the seat of a bishopric, suffragan to Bologna. It is surrounded by walls, defended by a citadel, and has two cathedrals, a seminary and manufactures of straw hats and spun silk. The neighborhood produces rice, wheat, hemp and flax. The chief industry, however, is the cultivation of the silkworm. Carpi was formerly the capital of the principality of Carpi. Pop. (1911) 27,465.

CARPIO, Manuel, mä'noo-ĕl kär'pē-ō, Mexican poet and physician: b. Casamaloapan, 1 March 1791; d. 11 Feb. 1860. He studied medicine, translated the 'Aphorisms' of Hippocrates (Mexico 1823); and became professor of physiology in the University of Mexico. Entering political life he became a leader of the Conservatives. In 1825 and 1848 he was deputy, in 1851 senator and in 1853 councillor of state. Several editions of his 'Poesias' have been published, the latest at Vera Cruz and Paris in 1883.

CARPOPHORE, a stalk of a sporocarp; the stalk raising the gynecium above the whorl of the stamens, as in *Passiflora*. Also a prolongation of the axis between the carpels, as in *Umbelliferæ*.

CARPUS, in anatomy, the bones between the forearm and hand, the wrist in man, or corresponding part in other animals. See HAND.

CARPZOV, kärp'tsŏf, the name of a German family which has furnished several eminent jurists and theologians. The founder of the family was Simon Carpzov, burgomaster of Brandenburg, in the middle of the 16th century. He had two sons: Joachim, who at his death at Glückstadt in Holstein, in 1628, was commander-in-chief of the Danish army; and Benedict, b. 22 Oct. 1565; d. 26 Nov. 1624. He was appointed professor of law at Wittenberg in 1595, became chancellor of the Dowager-Electress Sophia at Kolditz, but afterward returned to Wittenberg. A second Benedict, son of the former, b. Wittenberg 1595; d. 1666; became assessor of the Supreme Court and professor of law at Leipzig in 1645, then councillor of the Court of Appeal and member of the privy council at Dresden. He was one of the most eminent jurists of his day, and is the author of several valuable legal works; but is justly censured for the severity and cruelty of his proceedings. He is said to have signed the death-warrants of not fewer than 20,000 persons. JOHANN BENEDICT CARPZOV, his brother (b. Rochlitz 1607; d. 1657); became professor of theology at Leipzig, and is famed as the author of the 'Systema Theologicum' (1653). He left five sons, one of whom, JOHANN BENEDICT (b. 1639; d. 1669), became professor of theology and pastor of Saint Thomas' Church at Leipzig, distinguished himself by his knowledge of Hebrew language and literature and translated several rabbinical works. Another member of the family, JOHANN GOTTLOB CARPZOV, born at Dresden in 1679, became professor of Oriental languages at Leipzig, and died as superintendent at Lübeck in 1767. He was one of the most eminent theologians of his time, and wrote, among other treatises, 'Critica Sacra Veteris Testamenti' (1728); 'Introductio in Libros Canonicos Veteris Testamenti.' On the family of Carpzov, see Dreyhaupt, 'Beschreibung des Saalkreises' (Beilagen zu Theil 2 S. 26).

CARQUINEZ, kär-kē'nēs, or **KARQUENAS,** a strait between Contra Costa and Salano counties, California; its greatest width is two miles and its length seven miles; it is navigable, and connects the bays of San Pablo and Suisun. Benicia is on the north and Martinez, Port Costa and Crockett are on the south shore.

CARR, Dabney, American colonial politician: b. 26 Oct. 1743; d. May 1773. He was graduated at William and Mary College in 1762 and entered the profession of law. He was a member of the house of burgesses of Virginia, and moved and eloquently supported a resolution to appoint a committee of grievances and correspondence, in consequence of British encroachments. His resolution was adopted, 3 March 1773. He married a sister of Jefferson, by whom he is described as a man of sound judgment and inflexible purpose, mingled with amiability, and of a fanciful eloquence.

CARR, Eugene Asa, American army officer. b. Concord, N. Y., 20 March 1830; d.

1910. He was graduated at the United States Military Academy in 1850, and joined the Mounted Rifles. He accompanied the Sioux Expedition in 1855, and was active in suppressing the insurrections on the Kansas border in 1856. In 1860 he was engaged in a campaign against the Comanche Indians. He was in active service throughout the Civil War, commanding the 4th division of the Army of the Southwest and subsequently acting as commander of the same army. He commanded a division in the Vicksburg campaign in 1863, and led the assault on the works of that city, 18 May. In December 1863 he was assigned to the Army of Arkansas. At the close of the war he was promoted to brigadier-general, United States Army, and brevetted major-general of volunteers. In 1868–69 he was engaged against the Sioux and Cheyenne Indians, and afterward took part in other expeditions against hostile Indians. He fought in 13 engagements with Indians, was four times wounded in action, and received a congressional medal of honor and the thanks of the legislatures of Nebraska, Colorado and New Mexico. He was retired in 1893.

CARR, Joseph Bradford, American military officer: b. Albany, N. Y., 16 Aug. 1828; d. Troy, N. Y., 24 Feb. 1895. He joined the militia in 1849, and rose to the rank of colonel. In 1861 he was appointed colonel of the 28th New York Volunteers, and led them at the battle of Big Bethel and in McClellan's Peninsular campaign. He took part in the battles of Chancellorsville and Gettysburg, and for his bravery throughout the war he was brevetted a major-general of volunteers. After the war he became prominent in Republican politics in New York State, and was elected secretary of state in 1879, 1881 and 1883. In 1885 he was an unsuccessful candidate for lieutenant-governor.

CARR, Joseph William Comyns, English art critic and dramatist: b. 1 March 1849. He was educated at London University and was admitted a barrister of the Inner Temple in 1869.He has been English editor of *L'Art* and art critic of the *Pall Mall Gazette*. He has published ‘Drawings by the Old Masters’ (1877); ‘The Abbey Church of Saint Albans’ (1878); ‘Examples of Contemporary Art’ (1878)’ ‘Essays on Art’; ‘Papers on Art’; ‘A Fireside Hamlet’; ‘The United Pair’’; ‘The Naturalist’; ‘The Friar’; ‘Forgiveness’; ‘King Arthur’; ‘Some Eminent Victorians’; ‘Coasting Bohemia.’

CARR, Lucien, American archæologist: b. Troy, Lincoln County, Mo., 15 Dec. 1829; d. Cambridge, Mass., 27 Jan. 1915. He was graduated at Saint Louis University in 1846. Having marked literary ability he turned to journalism, and from 1848 was connected with the Missouri *Republican*. Editorial work began to undermine his health and he retired for a time to the country, where he devoted himself to study. In 1867 he removed to Cambridge, which was his home for the rest of his life. Having early taken an interest in the study of the Indians and of American archæology, he was soon recognized as an expert in that field, and after the establishment of the Peabody Museum he was closely associated with its work, serving as assistant curator of the museum from 1877 to 1894. With Prof. N. S. Shaler of the Lawrence Scientific School he wrote ‘Prehistoric Remains of Kentucky.’ Among his independent publications are ‘The Mounds of the Mississippi Valley Historically Considered’ (1883); and an historical volume on Missouri (1888).

CARR, or **KER, Robert,** Viscount Rochester, Earl of Somerset, a British politician: b. Scotland; d. July 1645. He followed James I to England, when that monarch became Elizabeth's successor. James chose him as his chief favorite and adviser, knighted him, gave him a seat in the House of Lords and assisted him in his schemes for a marriage with Lady Essex. The latter after procuring a divorce was married to the Earl, and in 1615 the couple were tried for the murder of Sir Thomas Overbury, who had been Carr's confidant in the amorous intrigue with Lady Essex. They were condemned to death but pardoned. Somerset lived in obscurity until his death. Consult Ranke, ‘History of England, Principally in the 17th Century’ (Vol. I, Oxford 1875); Gardiner, ‘History of England’ (Vol. II, London and New York 1889); the latter's article in the ‘Dictionary of National Biography’ (Vol. IX); Archbishop Abbot ‘The Case of Impotency in that Remarkable Tryal An. 1613 Between Robert, Earl of Essex, and Lady Frances Howard’ (London 1715); Amos, ‘The Great Oyer of Poisoning’ (London 1846).

CARR, Sir **Robert,** British commissioner in New England: b. Northumberland; d. Bristol, England, 1 June 1667. He was appointed to that office by Charles II in 1664, in conjunction with Nicolls, Cartwright and Maverick. In 1664, Nicolls and Carr captured New Amsterdam from the Dutch, calling it New York, in honor of the King's brother, the Duke of York, after James II. Carr forced the Swedes and Dutch on the Delaware into a capitulation. He returned to Boston in 1665, but met with stubborn opposition from the authorities, who refused to acknowledge his commissionership, as did also the people of New Hampshire. Maine, however, submitted and was governed separately from Massachusetts from 1666–68.

CARRACCI, kär-rä'chē, or **CARACCI, Agostino,** Italian artist: b. Bologna 1558; d. Parma 1602. One of a family of artists who founded the Bolognese or Eclectic school of painting. He was a brother of Annibale Carracci, and distantly related to Lodovico Carracci, under whose guidance he studied art. He studied painting under Fontana and engraving with Tibaldi and Cornelis Cort. He attained great mastery in engraving, and engraved more pieces than he painted, in order, it is said, to please his brother Annibale, who became envious of his fame after one of Agostino's pictures had obtained a prize in preference to one of his own, and another excellent picture — ‘The Last Communion of Saint Jerome’ (now in Pinacoteca of Bologna, 1592) —had gained his brother universal admiration. In 1600 Agostino accompanied Annibale to Rome, and assisted him in designing and painting the Farnesian Gallery. He painted the two principal features of the long walls, the ‘Triumph of Galatea’ and the ‘Rape of Cephalus.’ As many persons said that the engraver worked better than the painter, Annibale removed his brother, under the pretext that his style, though elegant, was not grand enough. Agostino went then to the court of the Duke of Parma, and painted there a picture representing the heavenly, the earthly and the venal love. There was only one figure wanting when, exhausted by labor and mortification, he retired to a Capuchin monastery where he died. He wrote a treatise on perspective and architecture. As an engraver he deserves great praise, and often corrected the imperfect outlines of his originals. He left behind 278 plates, a large number of which are original. He was distinguished for his exactness in drawing, his harmonious composition and the extreme delicacy of his coloring. For bibliography see CARRACCI, LODOVICO.

CARRACCI, Annibale, Italian painter: b. Bologna 1560; d. Rome 1609. He worked first with his father, who was a tailor. By the advice of Lodovico Carracci he learned drawing, and made the most astonishing progress, copying first the pieces of Correggio, Titian and Paul Veronese, and painting, like them, small pictures, before he undertook large ones. In the academy founded by the Carracci he taught the rules of arrangement and distribution of figures. He is one of the greatest imitators of Correggio. His 'St. Roque Distributing Alms,' now in Dresden, was the first painting which gave him reputation. His 'Genius of Glory' is likewise celebrated. In the Farnesian Gallery at Rome, which he, aided by his brother Agostino, painted (1600–04), there breathes an antique elegance and all the grace of Raphael. You find there imitations of Tibaldi (who painted at Bologna about 1550 with Nicolo del Abate), of Michelangelo (the style, indeed, somewhat softened), and the excellencies of the Venetian and Lombard schools. Outside of Bologna he is acknowledged as the greatest of the Carracci. In that city, however, Lodovico is more admired. Agostino, perhaps, had more invention, and Lodovico more talent for teaching; but Annibale had a loftier spirit, more spontaneity, naïveté and naturalness, and his style is more eloquent and noble. His atélier in Rome was the workshop of many famous artists, among them Domenichino and Albani. He was buried at the side of Raphael in the Pantheon. His best picture is that of 'The Three Marys,' now at Castle Howard, in Yorkshire, England. He excelled in landscapes, many of which may be found in Paris, Petrograd, Madrid, Florence and especially in the Palazzo Doria Panifili, Rome. Consult Tietze, "Annibale Carraccis Gallerie in Palazzo Farnese und seine römische Werkstätte," in 'Jahrbuch der kunsthistorischen Sammlungen des allerhöchsten Kaiserhauses XXVI' (Vienna 1906); Schmerber, 'Betrachtungen über die italienische Malerei im 17ten Jahrhundert' (Strassburg 1906).

CARRACCI, Lodovico, lō-dō-vē'kō, Italian painter: b. Bologna 1555; d. 1619. He was the eldest of the three Carracci, and is regarded as the chief founder of their school. He was the son of a butcher, and appeared at first to be more fit for grinding colors than for transferring them to canvas. But his slowness did not arise from deficiency of talent, but from zeal for excellence. He detested all that was called ideal, and studied only nature, which he imitated with great care. At Florence he studied Andrea del Sarto, and enjoyed the instruction of Passigano. He went to Parma for the purpose of studying Correggio, who was then imitated by almost all the Florentine painters. At Bologna he endeavored to gain popularity for his new principles among the young artists, and united himself with his relatives, Agostino and Annibale Carracci, whom he sent in 1580 to Parma and Venice. In 1589 they established an academy for painters at Bologna, called the "Academia degli Incaminati" (i.e., "of those on the right way"), which they directed jointly till 1600, the year of the departure of Agostino and Annibale for Rome. From that time till his death Lodovico was sole director. The academy was so successful that similar institutions in Bologna had to be closed. Among his most famous pupils were Domenichino and Guido Reni. His first principle was, that the study of nature must be united with the imitation of the best masters. He soon gave an example of this principle in his 'Prophecy of John the Baptist,' in the monastery of the Carthusians, imitating in single figures the style of Raphael, Titian and Tintoretto. With his two relatives he painted the frieze of the Palazzo Magnani, showing the 'Story of Romulus'; the frieze of the Palazzo Sampiere, in which his share was the 'Battle of a Giant with Zeus'; the frescoes of the monastery of Santa Maria in Bosco, representing scenes from the lives of Saint Benedict and Saint Cecilia. The finest works of Lodovico are in Bologna, especially in the picture gallery or *Pinacoteca,* and among them are 'The Annunciation'; 'The Transfiguration'; and 'St. George and the Dragon.' For the cathedral of Piacenza he painted in 1608–09 two large canvasses representing the 'Burial of Mary' which are now in the Galleria Farnese, Parma, and a series of fine frescoes; in the sanctuary, 'Choruses of Angels,' a 'Limbus,' and in the arch over the tribune 'Angels Strewing Flowers.' In the same year, he executed 'Conversion of Saint Paul' for the Munich Gallery. He excelled in architectural views and in drawing, and in general was very thorough in all the branches of his art. He also executed several fine engravings. Consult "Die Malerschule von Bologna" in Dohme, 'Kunst und Künstler Italiens' (Vol. III, Leipzig 1879); Bolognini-Amorini, 'Vite dei pittori ed artefici Bolognesi' (Bologna 1843); id., 'Le vite di Lodovico, Agostino, Annibale ed altri dei Caracci' (Bologna 1842); contemporary accounts by Malvasia, 'Felsina pittrice' (Bologna 1678; new ed., 1841); Baglione, 'Le vite dei pittori dal pontificato del Gregorio XIII' (Rome 1649).

CARRAGEEN, kär'ra̧-gēn, **CARRAGHEEN,** or **IRISH MOSS,** a name applied to several species of marine algæ found abundantly near Waterford, Ireland, at a place called Carragheen, from which the name is derived. It abounds also on the rocks in other localities in Great Britain and Ireland, and is found on the east coast of North America. The species from which the carrageen of commerce is chiefly derived is seaweed called *Chondrus crispus.* The frond is thick, cartilaginous, somewhat fan-shaped, and repeatedly forked; color, various shades of purple or green. It is gathered from the rocks, washed, bleached in the sun and dried, and is then the Irish moss of commerce. In hot water it swells up, and on boiling it dissolves. The results of the analysis of Irish moss are somewhat discordant; but the main constituent is a mucilage, which differs from gums, starches and jellies by not giving their characteristic reactions. It is nutritious, and is substituted for animal jelly and starches in the preparation of soup, jellies, creams and similar dishes. It is of value in pulmonary troubles, and is also used by painters and others in preparation of size. It is sometimes confounded with Iceland moss, which is a lichen. See Iceland Moss.

CARRARA, kär-rä'rä, Italy, city in the province of Massa-e-Carrara, Tuscany, on the Lavensa, near the Mediterranean, and 60 miles west-northwest of Florence, and in a valley surrounded by the marble hills to which it owes its celebrity. An academy of sculpture is established here, and several artists have their residence, attracted by the convenience of obtaining marble almost cost-free. Carrara has some fine churches, an academy of the fine arts, a statue of Garibaldi. From 400 quarries 4,500 workmen cut and ship more than $1,000,000 worth of marble yearly, and 600 quarries in the neighborhood help to swell the total. The finest and whitest Italian marble, of which the most valuable varieties are Polvaccio, Bettogli and Crestola, is found in the valley of Torano, although in recent years the bluish marble of Bardiglio has come into favor. The Romans, whose tools are frequently discovered, called the stone «marmor lunense,» from the city of Luni, whose ruins are about three miles distant from Carrara. There is a museum containing numerous statues and Roman antiquities, also several fine churches. Pop. (1911) 49,492. See Carrara Marble.

CARRARA, kär-rä'rä, **MARBLE** (so called from the city of Carrara), the variety of marble generally employed by statuaries. It is a white crystalline limestone, sometimes with black or purplish veins, and occurs in deposits of enormous extent — veritable «marble mountains.» Carrara marble, which was formerly supposed to be a primitive limestone, is now considered an altered sub-carboniferous limestone. The plutonic action to which it has been subjected has served to obliterate the traces of fossils. The mountains containing the marble are situated a few miles from the sea, and reach the height of over 5,000 feet. Although the quarries have been worked for 2,000 years, having furnished the material for the Pantheon at Rome, the supply is still practically inexhaustible. Those quarries supplying the pure while marble used for statuary are the most valuable. The so-called «Carrara district,» embracing the communes of Carrara, Massa, Pietrasanta, Seravezra, Stazrema and Arni, is the centre of the marble industry. Carrara and Massa are the two most important, the former having a population in the city of 21,000 people, with an additional 21,000 in the mountain villages surrounding it and forming part of the commune. These villages are inhabited almost entirely by quarrymen and the laboring class. The commune of Massa has a population of about 24,000. Broadly speaking, the entire male population of these two communities is actively engaged in some branch of the marble industry. There were in 1901 in the district 611 quarries in active operation, of which 345 are at Carrara, 50 at Massa and the rest distributed among the places named above. In addition to these, there are perhaps double this number which have been opened and afterward abandoned as being unproductive, or in which, for various reasons, active work has for the time being ceased. Under the sanction of ancient laws, the mountains where the quarries are found are the property and under the direct control of the municipality of the district in which they are located. Applications for leases are made to the syndic of the town, and within a reasonable time, after survey, etc., the concession is granted. The concession is permanent, the only condition being that the grantee should formally renew it every 30 years, pay the annual rent, and work the property. The rent is merely nominal. Failure to pay it for two successive years or to develop the property in the same length of time renders the concession void. Quarries thus leased may be sold or transferred, or left as an inheritance by the grantee at any time, without formal permission from the grantor. Until 1890 most of the output of the quarries was transported to the local mills, and to the Marina for shipping, by ox-teams. But now the quarry railroad, completed in 1890, greatly facilitates this transportation. From Carrara it makes the difficult ascent of the mountains, through many tunnels and over high viaducts, to a point some 1,500 feet above the sea-level. Tremendous obstacles were overcome in the construction of these 15 miles of railroad, the completion of which cost about $4,000,000. Although largely patronized by the quarry owners, it has not as yet entirely supplanted the former method of hauling by ox-team. The United States is represented by a consular agent. The buildings of the city of Carrara are of marble, and in the churches of Sant' Andrea (13th century) and of the Madonna della Grazie are splendid marble statues of Rossi, Garibaldi and Mazzini. There is also a museum containing numerous statues and Roman antiquities.

CARRARAY, Philippines, a small island about 30 miles long and 6 miles wide. It has coal deposits. The population is sparse and wholly uncivilized, subsisting by trade with the neighboring islands of Samar and Luzon.

CARRÉ, kä-rä, **Michel,** French dramatist: b. Paris 1819; d. Argenteuil, near Paris, 27 June 1872. He first published a volume of Poems, ‹Folles rimes›; then turned to the drama and wrote ‹La jeunesse de Luther› (1843) and ‹Scaramouche et Pascariel.› He then worked in collaboration with other authors, especially with Jules Barbier. With him he wrote many dramas, vaudevilles and opera librettos, several of which met with much success; among their joint works are ‹Van Dyck à Londres› (with Narrey, 1848); ‹Jobin et Nanette› (with Battu, 1849); and ‹Le Tourbillon› (with Deslandes, 1866); ‹Galatée› (1852); ‹Faust et Marguerite› (1859); ‹Lalla Raukh› (1862); ‹Romeo et Juliette› (1867); ‹Mignon› (1867); ‹Hamlet› (1868); ‹Paul et Virginie› (1876).

CARREL, kā-rĕl, **Nicolas Armand,** French writer and republican leader: b. Rouen, 8 May 1800; d. 24 July 1836. He was educated at the military school of Saint Cyr. He entered enthusiastically into several of the secret political societies which were numerous in France after the restoration of the Bourbons. In 1819, when lieutenant of the garrisons of Belfort and Neubreisach, he became implicated in a conspiracy, and though his conduct escaped investigation he was removed with his regiment to Marseilles. He resigned his commission to take an active part in the politics of his time. Finally settled in Paris, he zealously prosecuted his historical and political studies, and became intimate with Thiers, Mignet and Augustin Thierry, particularly the last. He published a 'History of the Counter Revolution in England,' and in 1830 united with Thiers and Mignet in editing the *National,* which soon rose to be the leading opposition newspaper. After the revolution his colleagues joined the government, and he was left with the chief direction of the paper, which still continued in opposition. In 1832 the *National* became openly republican. Carrel was mortally wounded in a duel with Émile de Girardin. He has been called the Bayard of republican journalism. Littré republished his articles under the title, 'Œuvres politiques et littéraires' (5 vols., 1854–58).

CARREÑO, kā-rā'nyō, **Teresa,** Venezuelan pianist: b. Caracas, 22 Dec. 1853. She was educated by her father and by Julius Hoheni; in 1862 she appeared as a concert player in New York and attracted the interest of Gottschalk, who gave her some instruction especially in regard to playing his own compositions. She has traveled widely in America, and given many concerts; she not only has a high rank as a pianist, but also has won success as a concert singer, and has published a number of musical compositions. Her first husband was Sauret, the violinist, from whom she was divorced; she has also married and divorced Tagliapietra, the singer, and Eugene d'Albert, the pianist. In 1902 she married the younger brother of her second husband. A woman of many talents, she composed a string quartet, piano pieces of the salon order and the Venezuelan national hymn; she won admiration as a concert singer, and, while managing an opera company, successfully wielded the baton during the absence of the conductor. The chief traits of her playing are brilliancy, dash and masculine vigor, for which she gained the appellation of «the Valkyr of the piano.» The softer qualities are not greatly in evidence, but her intellectual grasp and breadth of interpretation place her among the greatest pianists.

CARREÑO DE MIRANDA, Juan, Spanish painter: b. Avilés, Asturias, 25 March 1614; d. Madrid 1685. He was a pupil of Bartolomé Roman and Pedro de Las Cuevas in Madrid, and became court painter to Philip IV and Charles II. He painted many portraits and excelled in religious subjects. He succeeded Velasquez as the first portrait painter of the Spanish court. As a colorist the Spaniards rank him with Titian and Vandyke. His principal paintings are a 'Magdalen in the Desert,' at Madrid; a 'Holy Family,' at Toledo; and a 'Baptism of our Saviour,' at Alcalá de Henares. His principal surviving frescoes were commissioned in 1669 by Velasquez and painted with the assistance of Francesco Rizi. They are at Saint' Antonio de los Portugeses in Madrid and at the cathedral in Toledo. Consult Beruete y Moret, 'The Madrid School of Painting' (London 1909).

CARRER, kär'rĕr, **Luigi,** Venetian poet: b. Venice 1801; d. 23 Dec. 1850. He was professor of philosophy at Padua from 1830 to 1833, when he went to Venice, where he conducted a literary journal for nine years, during which time he was also appointed by the municipal council professor in the school of arts and sciences, and director of the museum. Here he published several works, the most popular of which is 'L'Anello di sette gemme,' a poetic description of the history and customs of Venice. His works were published with a biography by Crespan (Venice 1869) and by Abrate, 'L'opera poetica di L. Carrer' (Turin 1905).

CARRERA, kär-rā'ra, the name of three brothers distinguished as Chilean revolutionists — José Miguel, Juan José and Luis. The chief of them, José Miguel, was born at Santiago, 15 Oct. 1785; d. 5 Sept. 1821. They were the sons of a rich landholder in Santiago, Don Ignacio Carrera. José Miguel Carrera became a major in the Spanish army. The revolution attracted him to Chile where he became a member of the junta in 1810, usurping the presidency, and, in 1811, becoming military dictator. His internal administration was most effective. He established the newspaper *La Aurora,* the first paper in Chile. In 1813 he was deposed and succeeded by O'Higgins. The brothers Juan José and Luis were apprehended in 1817 near Mendoza, on a political charge, and having been first induced to attempt an escape, were brought to trial and executed 18 March 1818. José Miguel raised a body of troops to revenge their death, and a conspiracy was formed in his favor; but it was detected and suppressed, and he himself being defeated and taken prisoner, was executed on the same spot as his brothers. A bronze statue to José Miguel was erected at Santiago, Chile, 1864.

CARRERA, Rafael, Guatemalan revolutionist: b. Guatemala 1814; d. there, 14 April 1865. He was of mixed Indian and negro blood. In 1837 he placed himself at the head of a band of insurgent mountaineers. Enlisting the sympathies of the Indian population, the rebellion spread. Carrera was in turns courted and caressed by members of the opposite factions which divided the government. In February 1838, he occupied the city of Guatemala with 6,000 Indians, and succeeded in restraining his followers from anticipated pillage and massacre. Having secured his victory, he became dictator in 1840, and from 1844 to 1848 was President of Guatemala; was re-elected in 1852, and made President for life in 1854. He recalled the Jesuits, who in 1767 were banished, and in 1863 he engaged in war with Salvador. After capturing San Salvador, the capital, he deposed President Barrios and appointed Dueñas in his stead.

CARRERA, Valentino, Italian dramatic poet: b. Turin, 19 Dec. 1834. He was connected with the Italian Customs Department until his retirement from office in 1878. He is one of the most original dramatists of Italy, especially in comedy. Among his many comedies, vaudevilles, etc., the play which won for him a wide reputation was 'La quaderna di Nanni' (1870), a perfect picture of Florentine life. Other works are 'Galateo nuovissimo' (1875), 'Bastoni fra le ruote' (1884) and 'La filosofia di Giannina' (1885). A collective edition appeared in Turin in 1887–90 (4 vols.).

CARRERE, John Merven, American architect: b. Rio de Janeiro, Brazil, 9 Nov. 1858; d. 1 March 1911. He was of American parentage and his education was obtained in Switzerland. He was graduated from the École des Beaux Arts, Paris, in 1882, and since 1884 was a partner in the firm of Carrere & Hastings, New York. The firm rapidly acquired a distinguished reputation for the imaginative and artistic quality of its work, strongly colored by French influence. The first important commissions of the young practitioners were the Ponce de Leon and Alcazar hotels at Saint Augustine, Fla. Other early works were the Central Congregational Church at Providence, R. I., and the Mail and Express and Edison buildings in New York. The list of their later works is very long; by far the most notable is the Public Library of New York, erected at a cost of over $8,000,000 from designs which won the prize in a competition in which many of the ablest architects of the country were employed. He died 1 March 1911, as the result of an accident. The body was laid in state in the still unfinished Public Library, and the great throngs that pressed to view it attested the high regard in which he was held.

CARRHÆ, kăr'rē, the name of the site of an ancient city in northwestern Mesopotamia, supposed to have been the biblical Haran. It is famous in history for the disastrous defeat of Crassus by the Parthians, 53 B.C.

CARRIACOU, kăr-rē-ą-koo', the largest of the Grenadine Islands, in the British West Indies, seven miles long and from two to four broad. It is well cultivated and produces good crops of cotton. The town and harbor of Hillsborough are on its west side. Area, nearly 11 square miles. Pop. (1911) 6,886.

CARRIAGE, a general term for vehicles of all sorts, especially wheeled vehicles; in a narrower sense confined to those vehicles that carry persons only, for pleasure or business. The carriage is as old as the wheel. The first man who cut two slices from a tree-trunk and mounted them on an axle was the builder of the first carriage. The early Egyptians and Assyrians knew how to make wheels, as evidenced by carvings on their monuments. Some of these show a wheel made with tire and spokes, a construction indicating considerable mechanical knowledge.

Wheels held in place by wooden pins in the axle, a pole to which the horses were attached, and a rude box open at the rear, constituted the early chariots. These and the primitive carts were always two-wheeled. Four-wheeled carriages came into use with the formation of comparatively smooth roads, being ill adapted to rough and unkept highways. The earliest vehicles were made almost wholly of wood, pinned together, the holes being often burned in, and the parts tied with thongs. The Romans made use of the two-wheeled *carruca* (from which word «carriage» is derived), but although chariots of war and carts for transportation were comparatively common from early times, the carriage proper, for conveying persons, was in very slight use before the 16th century.

As late as 1550 there were only three coaches in all Paris, and the stage coach did not make its appearance in England until 1555. When the coach and covered carriage first came into use they were considered fit only for women and children, men scorning to seek such protection from the weather as is afforded by a covered vehicle. By the opening of the 17th century the coach had become popular, and not only crowned heads, but titled families, commonly employed them, emblazoned with their arms and decorated to the highest degree. Some of the most beautiful and elegant handiwork of that period was expended in the ornamentation of coaches. Elaborate painting, upholstery and joiner-work combined to produce the most sumptuous of vehicles. No such extreme effort at display has characterized carriages of later generations.

About 1625 the hackney coach came into existence in London, and the hired cab soon became an established institution. The increase of post-roads and general improvement in highways caused a gradual increase in private carriages and wheeled vehicles of all sorts during the 17th and 18th centuries. The bodies of these early carriages and coaches were suspended by leather straps, and depended on these, in combination with the springiness of the timber employed, to reduce the shocks and jolts to the occupants. That they were jolty enough to afford considerable exercise can be testified to by those who have taken up the modern sport of coaching in imitation of the old-time tally-ho coach. About 1700, steel springs were introduced, but they did not make very rapid headway. The C spring was a radical improvement, but gave way to the elliptic spring, which was invented in 1804 and remains in use to the present day. The rubber-tired wheel was borrowed from the bicycle about 1875, and still further added to the comfort of carriage riders, while the pneumatic tire of more recent date affords the latest refinement of comfort.

The various wheeled vehicles that may be grouped under the name «carriage» embrace a wide nomenclature, the best known being here grouped.

Auto-car, Auto-truck, etc. A car, truck, etc., having an automatic engine. See AUTOMOBILE.

Barouche, a four-wheeled, falling top carriage, with low body, two inside seats facing, and an outer driver's seat.

Berlin, a four-wheeled covered carriage having a rear seat behind the body.

Britzska, or *Breet,* a four-wheeled Russian carriage with falling top and a rear seat uncovered.

Brougham, a four-wheeled covered carriage with outer driver's seat, and the fore body cut under so as to turn short. The *miniature brougham* seats only two.

Buckboard, a very simple form of carriage, in which a springboard of wood takes the place of the springs, the seat being placed in the centre of the springboard.

Buggy, a light carriage with either two or four wheels, and with or without a top.

Cab (short for *cabriolet,* but of more general meaning), a carriage licensed to carry passengers for hire, usually closed, with an outer driver's seat.

Cabriolet, a two-wheeled (later four-wheeled), two-seated, covered carriage with falling top.

Calash, or *Calêche,* a two-wheeled carriage with a falling or folding top, a seat for two passengers and a narrow seat on the dashboard for the driver; much used in Canada. The top itself is also called a calash.

Car, (1) An automobile with two or more seats; (2) a railway carriage; (3) a carriage of unusual magnificence, as for use in a procession; (4) a van; (5) one of various special forms of vehicle, as the Irish jaunting-car.

Carryall, a four-wheeled covered carriage, light and commodious, having two or more seats.

Cart, (1) a two-wheeled, light, topless pleasure vehicle; (2) a heavy two-wheeled springless vehicle, with a strong box, for carrying rough material.

Chaise, originally a two-wheeled, one-horse vehicle with a top, the body being hung on straps; later, a light, topless, four-wheeled carriage of varying construction.

Chariot, the early two-wheeled war-carriage; also a light 18th-century coach, with one inner seat and a driver's seat.

Coach, a four-wheeled covered carriage of large size, having two or more inner seats and one or more outside — a tally-ho; also, a two-seated four-wheeled cab, or large hack.

Coupé, a four-wheeled carriage, low-bodied, with an outer driver's seat.

Curricle, a simple form of two-wheeled two-horse carriage.

Dog-cart, a light pleasure cart with back-to-back seats, the rear seat covering a box to carry a dog or dogs.

Drag, a form of coach or tally-ho, sometimes uncovered.

Drosky, a long-bodied, four-wheeled Russian carriage. In its primitive form the body is a plank on which the passengers ride astride; also, in some European cities, a public hack.

Fiacre, the French name for a public cab.

Gig, a very light, small-bodied, two-wheeled, one-horse vehicle, with seat for one.

Hack, a hackney coach; loosely, any cab.

Hackney Coach, a four-wheeled coach kept for hire.

Hansom, or *Hansom Cab,* a two-wheeled, low-bodied, one-horse, covered carriage, having a single seat closed in with front doors, and a seat for the driver behind.

Jaunting-Car, a light two-wheeled, sometimes four-wheeled, vehicle having a perch in front for the driver, and longitudinal seats extend over the wheels, and a well between them for baggage.

Landau, a coach-like vehicle having a top, the forward part of which is removable and the rear part folding.

Landaulet, a one-seated landau.

Omnibus, a four-wheeled covered carriage with long body, seats running longitudinally, a rear door with steps; often with seats on the roof.

Phaeton, a light pleasure carriage of varying construction, usually low-bodied.

Rockaway, a four-wheeled pleasure carriage with two seats and permanent top.

Sociable, a four-wheeled topless pleasure carriage, with facing seats.

Stage, a four-wheeled carriage of large size, with several seats inside and on top, for long journeys; called also stage coach; loosely, an omnibus.

Sulky, a two-wheeled carriage, of skeleton construction, with a seat for one directly on the shafts.

Surrey, a light four-wheeled box carriage with two seats and often side-bars.

Tally-ho, a four-in-hand coach.

T Cart, a pleasure cart having a T-shaped body.

Trap, a pleasure carriage; a term used very loosely.

Van, a very large covered wagon for conveying bulky articles, as furniture.

Victoria, a four-wheeled carriage with falling top, a seat in the body for two and an elevated driver's seat cut under.

Wagon, a heavy four-wheeled vehicle, usually with rectangular box, for carrying goods, sometimes with removable seats, and often with removable top.

Wagonette, a light wagon for pleasure riding, with longitudinal seats facing each other, and entered by steps and a door in the rear.

To these might be added many more compound names, as top-buggy, box-buggy, post-chaise, etc. It is difficult sometimes to draw the line of distinction absolutely between many of the forms of carriages here named. Even the very common names of «coach» and «cab» overlap in use, that which one would call a cab in one part of the country being known as a coach in some other section.

The important parts common to the typical form of carriage are as follows: Body, seat, top, hood, dashboard, apron, step, springs, running-gear, perch, forward gear, clip, fifth-wheel, tongue, shafts, swingletree, doubletree, axle, wheel, hub, spoke, felloe, tire. The body of a carriage is commonly made of selected hard wood, ash, oak, hickory, etc., being preferred. It is put together with iron braces, screws, mortises, and tenons, and glue. The top, if permanent, is supported on selected wood uprights, or, if falling, is framed of iron or steel rods that fold up and open into a braced position. Leather, canvas and leatherette are used as coverings. The gear, axles, shafts, poles, etc., are commonly of wood, selected with special reference to straight grain and consequent strength. The parts are largely reinforced with metal at all points where special strength or resistance to friction is essential. The tendency is to increase the use of metal to replace wood, and many carriages are made with steel axles and side-bars.

The fifth-wheel is the circular device in which the forward axle turns, and is made of iron or steel. The axles have metal boxes, which in the old style are lubricated with axle-grease, but in many modern vehicles roller-bearings are being substituted that run with very little or no lubrication. The regulation wooden carriage-wheel has spokes let into the hub and felloes, the whole being held together by the pressure of an iron tire. Instead of making a wheel in the form of a flat disc, the practice is to make it dishing; that is, with the spokes inclining slightly away from the body of the carriage. The reason for this is that a vehicle wheel that is one of a pair receives the most strain when the vehicle is on an incline tipped to one side. In this position of severest strain the spokes of the wheel on the lower side nearest the ground bear the weight, and when dished are inclined to the best position to receive the load.

This dishing of the wheel produces a necessity for placing the axle box slightly out of alignment. A dished wheel running on a straight axle tends to bear against the end nut and work off the axle. By drawing the axle skein slightly inward at the forward side this tendency is overcome and the wheel runs true. The wire wheel, or bicycle wheel, as it is commonly called, is made on a different principle, and dishing of the spokes and drawing of the axle are unnecessary. In these wheels the hub may be regarded as suspended from the tire, and the wire spokes are so spread that they receive the strains due to an inclined roadway to as good advantage as would the spokes of a dished wooden wheel.

Previous to 1850 most carriages were built by wheelwrights, assisted by blacksmiths, and the wheelwright's shop was to be found beside the blacksmith's shop in nearly every village. The development of carriage manufactories changed all this. The carriage factories buy their lumber and hardwood and supplies in large quantities, and use up the raw material in a more economical manner than could the wheelwright; but their greatest advantage is the use of special machinery.

The term «railway carriage» was commonly employed in the early days of railroads, and is still in use in Great Britain, where «coach» is, however, the technical word, but in the United States it has given way almost wholly to the shorter and more distinguished «car». See CAR BUILDING INDUSTRY.

CHARLES H. COCHRANE,
Author of 'Modern Industrial Progress.'

CARRIAGE AND WAGON INDUSTRY. Probably one of the most salient features in the progress of the world and one which has added greatly to the sum-total of human happiness has been transportation by means of vehicles. The attempt to discover the birthplace of the industry and the study of the advancement in the art of construction are of great interest not only for the history itself, but for the fact that in it are bound the true history of the advancement of the world; the histories of peoples, long forgot, who have contributed largely to the comfort and ease which we now enjoy. The historical records of which we are possessed prove that mankind has utilized wheels as a means of transportation from the earliest periods. The float was undoubtedly the first means of constructive transportation and from this we find the inventive genius of man devising all manner of conveyances for use on land. First came the sledge and this gradually developed into a more perfect mode of conveyance, mounted on rollers, until we have the axle and the wheel. The roller made from a tree trunk with the centre shaped down so as to make a rotating axle was the most primitive form of wheel. The next move came in the shape of the substitution of two shorter sections of tree trunk attached to a rotating axle; then came the stationary axle on which the wheels revolved. Carts drawn by men and by oxen and innumerable chariots may be seen on the great sculptured stones now in the British Museum, taken from the ruins of the city of Nimrod near Nineveh. The body is framed up with posts and a top rail and the basket is made of handsome wicker-work; the wheels are about 42 inches in height, well proportioned, have six spokes and over them is an arched guard to prevent anything from coming into contact with them. On another slab, the king's chariot with an elegant canopy overhead, and carrying also the charioteer and an arms-bearer, is shown. The next noteworthy advancement was in the cart wheel, which was similar in shape to that now in use in the inland districts of Mexico. The Assyrian Empire, though founded prior to that of the Egyptians, did nothing whatever to advance the methods in construction, and it was left to the Egyptian to originate and develop the more perfect chariot, which for centuries afterward was the sole means of land transportation and which was connected with all great undertakings. In Biblical, mythological and all ancient history, chariots form an interesting and important part. In Biblical history the chariot is frequently referred to; the strength of a nation was determined by the number of chariots in its army. Pharaoh gave much time and thought to the improvement and use of the chariot, with such effect that he was enabled to overtake the children of Israel in their flight, although his whole army was eventually engulfed in the Red Sea. In the New Testament we find the word «carriage» referred to as baggage. «After those days we took up our carriages and went to Jerusalem.» During these years the chariot developed and finally wagons for use on the farm made their appearance, some having two and others four wheels. To the Etrurians must be given the credit for first putting into use the canopy. Solomon tells in one of his songs of a beautiful stage coach which he built for his «Beloved,» of cedarwood, having a canopy of wonderful beauty and richness, supported by pillars of gold. According to Herodotus (450 B.C.), the Scythians built and had in daily use two-wheeled carts with a platform and basket and thatched with the reeds among which these people lived, and when not in use these baskets were taken off the carts and used as tents. The Greeks and Romans had of course made use of the horse in drawing their chariots, and in the story of the Trojan War, Achilles is described as dragging the body of Hector, lashed to his chariot, around the walls of Troy.

There was little of luxury in any of the vehicles of ancient days; the chariot with all its splendor and decoration was a comfortless thing without springs; even the triumphal and funeral cars of early history were springless; their demand and use for other than warlike or agricultural purposes was limited; but as the world progressed so did the vehicle, and though the improvement was slow, it was nevertheless sure. The *Arcera* was developed and first used in Rome as an ambulance; then followed the *Lectica* and the *Basterna,* similar to the *Palanquins* of India to-day, superbly decorated and upholstered in finest silk, with cushions stuffed with rose leaves. Following this came the *Carpentum,* decidedly a ladies' vehicle, which became very popular and was named in honor of Carmenta, the mother of Evander, the leader of the Arcadian colony into Latium. Then followed the *Carruca,* from which our modern name of «carriage» undoubtedly comes. This was a gorgeous affair, mounted originally upon one wheel after the fashion of a modern wheelbarrow, but later on two and then four wheels. The Romans considered it a great honor to ride in a *Carruca* and those vehicles were often highly decorated in gold, silver and ivory. As the *Carruca* became the popular vehicle for pleasure use, the *Chariot* for warlike purposes, so did the *Benna* come into general use as the popular vehicle for agricultural purposes. Julius Cæsar (55 B.C.) brought back with him from his triumphant visit to Britain a chariot that surpassed for destructiveness and convenience any then known, indicating that other nations were making progress in the manufacture of vehicles even beyond the confines of Rome.

During the «Imperial Reign of Terror» under the brutal ruler, Nero, we find but slight improvement in construction, although vehicles were extensively used. The practice of letting out vehicles for hire is of quite respectable, not to say hoary, age, for Suetonius, a noted Roman biographer and historian, mentions the custom as very general in his day, 150 A.D., and in his writings refers to these hired vehicles under the name of *Rheda,* the *Rheda Meritoria,* and the *Vehiculæ Meritoriæ,* both the latter on the order of a hackney coach open and closed.

When the world awakened from its apparent long sleep of the Middle Ages, during which the art of vehicle construction, like all other arts, sank into oblivion, manufacturing was revived and from this awakening, about 1400 A.D., very marked improvements are found. Emperors and kings vied with each other in the effort to outshine and outclass one another, and through this rivalry we note substantial advancement. In 1550 it is said that there were but three coaches in Paris, and within the next century we find the feudal lords throughout continental Europe supplying themselves with the most extravagant and luxurious of equipages, some costing more than $10,000 each. The artist's skill was employed, poets sang beautiful songs in their praise, and the epidemic spread, creating an eager desire in all to outrival their neighbors. Legislators became alarmed and a bill was introduced into the British Parliament seeking «to restrain the excessive use of coaches.» Taylor, the poet, complained as follows:

> Carroaches, coaches, jades and Flanders mares,
> Do rob us of our shares, our wares, our fares;
> Against the ground we stand and knock our heels,
> Whilst all our profit runs away on wheels.

Stow, in his survey of London, gives credit to Gulliam Booner, a Dutchman, who in 1564 became the Queen's coachman, as being the first to bring coaches into England. In 1582 the French King presented to Queen Elizabeth an exceedingly marvelous «coache» with four of the fairest white «moiles.» This wonderful state coach, with its highly ornamented and canopied body, was without springs. It was a sort of triumphal car for state parades. Her usual mode of locomotion was by water or on horseback. Captain Bailey introduced hackney coaches into England in 1625, and by his wide-awake advertising methods, made them the talk of all London.

Carriages without wheels were in use as late as the 17th century and were known as litters and were supported upon the backs of horses by means of shafts attached before and behind the litter. Carriages on wheels propelled otherwise than by horses are to be found in Japan, known as the *Jinrikisha,* and are drawn by a man running between the shafts. The modern vehicle has assumed almost limitless shapes and forms, and ages of progress lie between the gorgeous chariots and state cars of the ancient Romans and the modern buggy. From the old time stage coach we have progressed to the dray or tally-ho; we no longer have the post-chaise or the curricle; but many of the olden types are still to be seen, of course with many changes and improvements, of which the American buggy probably represents the acme of development of the carriage-maker's art. Many of these types have been imported from abroad, among them the English brougham, named for Lord Brougham; the landau, taking its title from the German town where it originated; and a few specimens of the Irish jaunting-car, which were so popular in their native land. In 1834 the hansom cab was patented by Mr. Hansom, and this originally was a square body hung in the centre of a square frame, with two wheels seven feet six inches in diameter and of the same height as the vehicle. The hackney coach was purely an English product, but to-day we see its lineal descendant in the American hack.

It was not, however, until after the middle of the 17th century that the manufacture of carriages gained much impetus, but from that time we find the brains and ingenuity of the American constantly making changes and improvements and, while the progress was slow but steady, the industry took a wonderful place in the history and development of our nation. All vehicles prior to 1750 were absolutely springless as previously stated; the running gears were very imperfect; the leather thorough-brace, which preceded the steel spring and which gave the first relief from the jolting of the old dead-axle carriage, was the first step in advancement in this line. The body of the carriage was suspended on these thorough-braces which were stretched from upright iron jacks at each end of the running part, and gave the carriage a long swinging motion, which, even though extremely uncomfortable, was far superior to the jolt caused by the springless vehicle. Next came the spring jack, made of steel plates, and which later was given a sweeping curve, and from which our more modern C spring evolved. The elliptic spring came into use about 100 years ago, and at about the same time the Collings axle was invented.

The post-chaise began to be used as a general means of travel in the beginning of the 18th century. It was a rambling affair, the body hung very high on leather straps, the wheels were far apart, and the postilions rode the «near» horses. This was improved upon until we see the stately chariot with its richly draped coachman's seat, but which, however, was not used except at state functions or at royal receptions. Before the Revolution, very little manufacturing was done in this country, the main business being repairing. The aristocracy of those times living in the large cities imported their coaches, carriages and phaetons from England and France, and of course the manufacturing end of the business languished through lack of customers. The number of repair shops grew as the number of vehicles increased and in all the large cities these establishments thrived, employing, for the most part, the skilled workmen who came from England, Ireland and Scotland.

The Revolution had left its mark upon the land, and during the times of poverty and distress which followed there was little use made of vehicles of any kind except among the wealthier class, and it was fortunate for the mechanics and tradesmen that this class found the means of transportation inadequate and insufficient to cope with the amount of travel made necessary by the foundation of the new republic. The next development was the chaise set upon two wheels, and it became very popular and came into greater demand as the prosperity of the country grew. It was known as the shay and became the subject of the well-known poem by Oliver Wendell Holmes, entitled 'The One-Horse Shay.' At the beginning these chaises were built without dashers, had high wheels and the tops were stationary. This style of vehicle grew to be very popular and for some years there were no changes made in construction.

In the early part of the 18th century the stagecoach was introduced into England and in 1745 the first line was established between London and Edinburgh, a distance of 400 miles, and it was stated «that a two-end glass coach machine, hung on steel springs, exceeding light and easy, would go through in 10 days in summer and 12 in winter, the passengers lying over during the Sabbath at one of the villages on the route.» They were introduced into the United States some years later and it is a mistaken idea that the stagecoach was unknown in America prior to 1810, for William Brant, attorney for General Hancock, states that in 1776, when Hancock married Dorothy Quincy, he took her by stage coach to Philadelphia on his wedding journey. The roads at this time were little better than bridle-paths and in them were many ruts or quagmires, making travel uncertain, slow and uncomfortable. In 1770 President Quincy of Harvard College wrote as follows of the stage journey between Boston and New York: «The carriages were old and shackling and much of the harness made of ropes. One pair of horses carried us 18 miles. We generally reached our resting place for the night, if no accident intervened, at 10 o'clock, and after a frugal supper, went to bed, with a notice that we should be called at 3 o'clock next morning, which generally proved to be half past two, and then, whether it snowed or rained, the traveler must rise and make ready by the help of a horn lantern and a farthing candle, and proceed on his way over bad roads, sometimes getting out to help the coachman lift the coach out of a quagmire or rut, and arriving at New York, after a week's travel, wondering at the ease, as well as the expedition, with which our journey was effected.» In 1791, there were only 1,905 miles of post-roads in the United States, and in these roads were many bottomless sloughs, and corduroy bridges which consisted of logs laid crosswise over swamps sometimes for long distances, but with the improvement of the roads and the advancement of civilization we find the industry of vehicle construction developing and spreading in America. Military roads and post-roads were built by the government across the mountains of Virginia, connecting the East with the valley of Ohio; through the forests of Maine to the town of Houlton on the New Brunswick frontier, and also in other parts of the country. Stage lines were established on these roads and thrived; much capital was invested; the business rapidly grew, and the returns from the investments proved enormous. Factories began to spring up here and there. The great Canestoga wagon, with its broad wheels and canvas-covered body, and drawn by six or eight horses, came into use in New York, New Jersey and Pennsylvania for the transportation of freight and passengers. Troy, N. Y., became famous for its coaches and wherever used they were sure of patronage; Salem and Worcester, Mass., loomed up as manufacturing centres, but the most famous was undoubtedly the Concord coach, originally made in Concord, N. H., by the house of Abbot, Downing & Company, who later, in 1815, moved to Salem, Mass.

The War of 1812 further helped the industry in that it threw us upon our own resources and started the emigrant and pioneer toward the great unknown West. This necessitated the emigrant wagon or prairie-schooner as it was called, and after that the lighter farm wagon. Stylish carriages and fine coaches began to come into demand in all the large cities. Boston, New Haven, Bridgeport, Newark, all had flourishing shops, and New York, Philadelphia, Baltimore and Wilmington were rapidly coming to the front. A considerable trade with the planters in the West Indies grew up, the vehicles being exchanged for the products of the plantations. These vehicles, which were two-wheeled and had very long shafts, were known as volantes. The wheels were placed in the rear, thus throwing a large portion of the weight on the horse's back, and besides this, the postilion rode the horse, giving him a double load.

As the emigration toward the West became greater and greater, the establishment of permanent factories and repair shops became necessary and the volume of business began to assume considerable proportions. One of the first to enter this new field was John Studebaker, who in 1835 settled at Ashland, Ohio, and there opened a small shop, though it remained, however, for his five sons to lay the foundation of the business at South Bend, Ind., operating under the name of Studebaker Brothers Manufacturing Company, and who are now among the largest of the 4,870 carriage and wagon manufacturers in the United States. It is a far cry from a village blacksmith shop with its solitary forge and one anvil to the marvelously equipped factories now operating, and when one considers the vast output (1,600,000 carriages, wagons and sleighs annually) he wonders where the markets are and where the purchasers are to be found. In the early part of the 19th century, the business was carried on by what was known as the «dicker» system. Money was seldom used in the transactions; the woodworkers, blacksmiths, etc., taking parts in exchange or as they said, «swapping,» and the final settlement was made in the finished carriage. This involved less chance of being in debt, and, according to the old operators, was much safer than the cash payments. But the country rapidly outgrew this system and well-organized and well-equipped shops took their places, and it seems as though we have almost reached the limit in quick and cheap methods of production, but undoubtedly the inventive genius of the American will continue to assert itself along this line and, instead of retrograding, we shall advance and always keep abreast of the times.

The modern system of factory production, making all parts in large quantities, and using special machinery, template and dies has to a great extent lessened the labor and cost of production; hence the cheapness in the price of vehicles at the present time. Of course there are many different grades of vehicles made in this country and, while in some instances the price is a fair indication of the quality of stock employed in the making, yet the tendency of the times is that the best grade of workmanship and material obtainable shall be put in all styles of vehicles, regardless of price, and the manufacturer who disregards this tendency may some time regret it. There is no reason why the downward rush of the selling price, which has been made possible only by the decline in the cost of production, should lower the quality or grade of the article produced; nor is this true of the large manufacturer in this country, who, realizing that the average American has neither the time nor the ability to make a close examination of the construction, and would not if he had, is perfectly willing to pay well for a good article, and who is bound by this trust put in him to give to the public the finest grade of work which the highest skill and care of the best designers and mechanics can produce. The most noteworthy feature in vehicle construction at the beginning of the 20th century is the rapidly increasing use of rubber tires. These tires first came into use about 1890, but were used mainly for trotting sulkies or runabouts and were not adaptable for the majority of pleasure vehicles for some time. The tires were then made solid and universally approved and broader tires were later adopted, especially in wagons to carry heavy loads, owing to the strong movement for good roads throughout the United States.

In 1872 the Carriage Builders National Association was founded by the leading manufacturers of the country. Realizing the necessity of having skilled workmen for the trade, a fund was raised to establish a school in New York city, where carriage drafting and construction was to be taught. This was a great success and has contributed largely to the advanced methods now in use in all our modern factories.

From the census tables it is apparent that there was a fair growth in number of establishments doing business during the 10 years from 1890 to 1900 but a decline from 1900 to 1905, which decline continues. The invested capital has increased, but the number of wage earners is reduced. The total production showed a gain of 10 per cent from 1900 to 1905, but since then has been stationary. The development of the automobile in place of the carriage and of the auto-truck in place of the wagon is, of course, responsible for the slowing down in the carriage and wagon industry.

This loss is in part compensated for in that carriage factories make a vast number of automobile tops and other parts and fittings of motor vehicles. The United States census of manufactures for 1914 classes carriages and wagons together as one industry, and the figures show that it is still large and prosperous. In that year there were built 558,492 family and pleasure carriages of the value of $34,193,518; and 572,613 wagons, three-fourths of which were farm wagons; and 1,287 miscellaneous buses, vans, etc.; besides 54,700 sleighs and sleds. There are 5,320 establishments, which produced $135,792,357 worth of vehicles, with an invested capital of $175,474,000, and employing 52,540 workers. To the above might be added the 622 establishments which make materials sold to carriage and wagon builders, with products of $16,500,000 above the cost of their materials and over 17,000 employees. If the children's carriage industry be added this gives a count of 84 more factories, with 5,769 employees, turning out over $4,000,000 worth of goods.

Ohio and Indiana are the leading States in the carriage building industry, closely followed by Pennsylvania and New York. There are also a considerable number of factories in Illinois, Michigan, Wisconsin, Missouri, Kentucky and Massachusetts.

J. M. Studebaker.

CARRICKFERGUS, kăr-rĭk-fėr'gŭs, Ireland, a seaport town in the county of Antrim, 10 miles by rail northeast of Belfast. It is a municipal borough, and also a county of itself, called the county of the town of Carrickfergus. It comprises an area of about 25 square miles, of which only 120 acres is embraced in the town proper, the remainder belonging to the territory of the county. The Bay of Carrickfergus is a small indentation on the north side of Belfast Lough. It is memorable in history as the landing-place of King William III, who disembarked on its shore at the quay of the town of Carrickfergus on 14 June 1690. The castle stands upon a rock projecting into the bay and is still maintained as a fortress, having a number of guns on the walls and a small garrison. The public buildings, besides the Episcopal, Roman Catholic and other churches, are a town-hall, courthouse, market-house, etc. Pop. about 9,000.

CARRIER, Common. See Common Carrier.

CARRIER, kä-rē-ā, **Jean Baptiste**, French Jacobin: b. Yolet, near Aurillac, 1756; d. Paris, 16 Dec. 1794. At the beginning of the Revolution he was an obscure attorney, but in 1792 was chosen a member of the convention. He aided in the establishment of the revolutionary tribunal, 10 March 1793, and exhibited the wildest rage for persecution. He voted for the death of Louis XVI, demanded the arrest of the Duke of Orleans, 6 April 1793, and contributed greatly to the outbreak of 31 May. On 8 Oct. 1793 he was sent to Nantes with a commission to suppress the civil war and finally put down the Vendeans. Multitudes, informally and precipitately condemned, were executed daily; but Carrier resolved to destroy the prisoners by numbers at a time and without a trial. He first caused 94 priests to be conveyed to a boat with a perforated bottom, under pretense of transporting them, but in reality with a view of having them drowned by night. This artifice was repeated a number of times, and the victims were of every age and of both sexes. These wholesale murders by drowning were called noyades. It has been estimated that 15,000 individuals perished in this manner. The banks of the Loire were strewed with the dead, and the water was so polluted that drinking it was prohibited. Out of terror people refrained for a time from drawing public attention to these atrocities, but at last the truth began to become known and Carrier was recalled. Shortly after the fall of Robespierre he was arrested and brought before the revolutionary tribunal, which condemned him to death, and he was guillotined accordingly.

CARRIER-BELLEUSE, kä-rē-ā-bĕl-lēz, **Albert Ernest,** French sculptor: b. Anizy-le-Chateau, 12 June 1824; d. Paris, 3 June 1887. He was a pupil of David d'Angers, and while studying was compelled to earn his living by making models for the manufacturers of bronzes. His first work, a marble statue representing 'The Death of General Desaix,' brought him to the notice of the public (1859); and it was followed a few years later by a Bacchante. 'The Messiah,' a group now at Saint Vincent de Paul's at Rome, won him the medal of honor 1867. Toward the close of his life he was director of the art department of the porcelain works at Sèvres. His works include marble sculptures and terra-cotta busts; among them are 'Angelica'; 'Madonna and Child' (in the church of Saint Vincent de Paul in Paris); 'Sleeping Hebe'; 'Forsaken Psyche'; and of busts of remarkable truthfulness to life of Gauthier, About, Renan, where he is seen at his best.

CARRIER-PIGEON. See HOMING PIGEON.

CARRIER SHELL, or MASON SHELL, a gastropod mollusk of the genus *Phorus,* which covers its shell with grains of sand, shell, coral, etc. These bits are fastened by an exudation from the mantle, and are apparently protective in their purpose.

CARRIERA, kä-ryā'ra, **Rosalba,** an Italian miniature painter: b. Venice 1675; d. 1757. After learning lace-making from her mother she applied herself to decorating snuff-boxes. After this she studied miniature and pastel, but soon surpassed her teachers and became known throughout Italy. Her early portraits include those of Maximilian II of Bavaria, Frederick IV of Denmark, 12 Venetian ladies, portrait of the artist and her sister Naneta (at the Uffizi Palace) and August the Strong, who was one of her early patrons. In 1720 she paid a visit to Paris, where she was enthusiastically received and elected a member of the Royal Academy. Her picture of reception was 'Muse Crowned with Laurel.' She kept a very interesting diary in Paris, which has been published by the Abbé Vianelli (1793). In 1721 she returned to Venice and visited Modena, Parma and Vienna. Her colors are extremely delicately laid; and her works, though often faulty in design, are full of a vivacious charm, which ranked her as the leading miniature and pastel painter of her day and comparable with Correggio. Specimens of her art are to be found in all the galleries of Europe, especially at Dresden and in the Louvre. 'The Four Seasons' (Dresden), six pastel portraits (Royal Gallery, Venice) and the portrait of the Princess Pia di Savoia Valcarel are excellent examples. In her old age she became blind and died insane. There are good biographies by Sensier (with a translation of her diary, Paris 1865), Von Hoerschelmann (Leipzig 1908) and Malamani (Milan 1910).

CARRIÉRE, Moritz, German philosopher: b. Griedel, Hesse, 5 March 1817; d. Munich, 19 Jan. 1895. He studied philosophy at Giessen, Göttingen, Berlin and in Italy. In 1849 he became professor of philosophy at Giessen and after 1853 held that position at Munich. He was a defender of Christianity, opposed Ultramontanism and was of the liberal school. He also took high rank as an art critic. Among his published works are 'Der Kölner Dom als freie deutsche Kirche' (1843); 'Abälard und Heloise' (1844); 'Die Religion in ihrem Begriff' (1841); 'Die philosophische Weltanschauung der Réformationszeit' (1847); 'Das Charakterbild Cromwells' (1851); 'Die Kunst im Zusammenhang der Kulturentwickelung und die Ideale der Menschheit' (5 vols., 3d ed., 1876–86); 'Æsthetik' (2d ed., 1873); 'Geschmack und Gewissen' (1882). His 'Gesammelte Werke' (14 vols.) appeared in Leipzig in 1886–94.

CARRIÉRES, Louis de, French theologian of the Roman Catholic Church: b. Auvilé 1662; d. Paris, 11 June 1717. In 1689 he joined the Congregation of the Oratory and became well known as a theologian. At the request of Bossuet he published a 'Commentaire littéral de l'Ecriture' (24 vols., 1701–16), reprinted Paris 1872.

CARRINGTON, Edward, American soldier: d. Charlotte County Va., 11 Feb. 1749; d. 28 Oct. 1810. He was lieutenant-colonel of General Harrison's artillery regiment, quartermaster-general under General Greene, a delegate to the Continental Congress and foreman of the jury in Aaron Burr's trial for treason.

CARRINGTON, Edward Codrington, American lawyer: b. Washington, D. C., 10 April 1872. He was educated under private tutors; was admitted to the Maryland bar in 1894 and has practised in Baltimore and New York. He is a member of the firm of Carrington & Carrington of Baltimore and New York, and specializes in corporation law. Governor Goldsborough appointed him a member of his staff with the rank of colonel. He was campaign manager for Theodore Roosevelt in Maryland in 1912, and was delegate-at-large to the Republican National Convention in Chicago the same year. He signed the call for the Progressive National Convention in 1912, and later became delegate-at-large to same; was a member of the Progressive National Committee 1912 and chairman of the Maryland Progressive State Committee. After the presidential election of 1912, he led a movement in Maryland, having for its object the union of the Republicans and Progressives. He was the regular Republican nominee for the United States Senate in 1914, but was defeated. He is a member of the Maryland State Bar Association. Mr. Carrington is interested in many large enterprises, is president of The Americana Corporation and treasurer of the J. B. Lyon Company, Albany, N. Y.

CARRINGTON, Fitzroy, American print expert and lecturer: b. Surbiton, Surrey, England, 6 Nov. 1869. He was educated in the island of Jersey at Victoria College, and came to the United States in his 17th year. From 1892–1913, a period of 21 years, he was connected with the art firm of Frederick Keppel & Company, in 1899 becoming a member of the firm. He became known by his illuminating analytical introductions to art editions of works such as Dantè, ‹New Life›; ‹The Queen's Garland› (Elizabethan verse); Rossetti's ‹Pictures and Poems›; William Morris's ‹The Doom of King Ærisius›; ‹The King's Lyrics› (1899); ‹The Shepherd's Pipe› (1903); ‹The Pilgrim's Staff› (1906). He published ‹Prints and their Makers› (1912) and was editor of the unique *Print-Collector's Quarterly* from 1911 to 1913, when he retired from business to become lecturer on the history and principles of engraving at Harvard University, and curator of prints at the Museum of Fine Arts, Boston.

CARRINGTON, Henry Beebee, American lawyer, soldier and historian: b. Wallingford, Conn., 2 March 1824; d. 1912. He was graduated at Yale in 1845; taught at Tarrytown, N. Y., 1846 and at Yale Law School 1847; began the practice of law in Columbus, Ohio, in 1848, and took an active part in the anti-slavery movement. In the convention which met in 1854 to organize the Republican party, Carrington was a member of the committee appointed to correspond with persons in the different States with a view of making the movement national. In 1857 he was adjutant-general on the staff of Governor Chase and organized the State militia in preparation for war. In 1861 he was appointed colonel of the 18th United States infantry, served through the Civil War, and afterward was in service on the plains; was wounded in war with Sioux Indians and retired in 1870; he became professor of military science and tactics in Wabash College, Ind., a position which he held till 1873. In 1890 he took a census of the Six Nations and the Cherokees. He wrote ‹Russia as a Nation› (1849); ‹American Classics›; ‹Ad-sa-ra-ka, Land of Massacre›; ‹Battles of the American Revolution› (1876); ‹Washington the Soldier›; ‹The Washington Obelisk and its Voices› (1887); ‹Lafayette and American Independence› and other works.

CARRINGTON, Paul, American statesman: b. Charlotte County, Va., 16 March 1733; d. 23 Jan. 1818. He was graduated at the College of William and Mary. During the Revolution he was a member of various conventions and of the Committee of Safety; opposed the Stamp-Act resolutions of Patrick Henry; became a member of the Court of Appeals, and in the Virginia convention voted for the adoption of the Federal constitution.

CARRINGTON, Richard, English astronomer: b. Chelsea, 26 May 1826; d. November 1875. Carrington entered Trinity College, Cambridge, in 1844, to prepare for the Church, but his scientific tendencies being awakened by the lectures of Professor Challis he turned his attention to astronomy. He held the post of observer at the University of Durham from 1849 to 1852. He was elected a fellow of the Royal Society (7 June 1860). His work ‹Observations on the Spots on the Sun› (1863) furnished data that materially affected the study of solar physics.

CARRION CROW, any of several large carrion-eating birds. The only true carrion crow (*Corvus corone*) is found in England. It is larger than a crow, of black plumage and with feathered neck. It is seldom seen in flocks, and lives upon carrion, small mammals, eggs and birds. In the southern United States the name is locally given to the black vulture (*Catharista atrata*), a bird closely related to the turkey-buzzard (q.v.), but smaller, and resembling it in habits and public service as a scavenger. Its bluish and spotted eggs number from one to three and are placed in a nest built under logs and bushes.

CARRION-FLOWERS, certain species of the genus *Stapelia* (natural order *Asclepiadaceæ*), so called because of their putrid odor. See SMILAX.

CARRIZO MOUNTAIN, a prominent peak in the northeastern corner of Arizona; altitude 9,420 feet. It consists of a laccolith or core of igneous rock which has uplifted the Dakota sandstone capping its summit. Consult W. B. Emery (in *American Journal of Science,* Vol. XLII, p. 349, 1916).

CARROLL, Charles, «of Carrollton,» American patriot: b. Annapolis, Md., 20 Sept. 1737; d. Baltimore, 14 Nov. 1832. He attended several schools abroad; studied law in Paris and London, where he became a member of the Inner Temple; returned to his native country in 1764. In 1775 he became a member of the «Committee of Observation» at Annapolis and in the same year was chosen member of the provincial convention. In 1776, he was one of the commission sent to persuade Canada to join the War of Independence. He was elected to the Continental Congress in 1775, and with the other members signed the Declaration of Independence, on 2 August of the following year. To make certain his identity, he added «of Carrollton» to his signature, thus distinguishing himself from another by using the name of his family mansion. After many more years of important public service to the State of Maryland and to the new republic, as drafter of the Maryland constitution, State senator, congressman, again senator (1789) and member of the Maryland and Virginia Boundary Commission, in 1804 he withdrew to private life at Carrollton, which was his patrimonial estate. There as his life advanced he became an object of universal veneration. He survived by six years all the other signers of the Declaration. Consult Latrobe, J. H. B., ‹Life› (Philadelphia 1824); Mayer (ed.), ‹Journal of Charles Carroll of Carrollton during his Visit to Canada in 1776, as One of the Commissioners from Congress› (Baltimore

1845); Rowland, 'Life of Charles Carroll of Carrollton' (2 vols., New York 1898).

CARROLL, Henry King, American clergyman and editor: b. Dennisville, N. J., 15 Nov. 1848. He was on the staff of *Hearth and Home* (Methodist), and from 1876 to 1898 was religious and political editor of the *Independent.* He has written 'The Religious Forces of the United States'; and many reviews, reports and miscellaneous papers. He supervised the compilation of religious statistics for the 11th census, and in 1898 was appointed to prepare a report on the internal conditions of Porto Rico. In 1900 he became a secretary of the Methodist Episcopal Church Missionary Society. He was executive secretary of the western section of the Ecumenical Methodist Conference of 1911. Besides government reports and numerous reviews, he has published 'Missionary Growth of the Methodist Episcopal Church' (1907).

CARROLL, Howard, American journalist and politician: b. Albany, N. Y., 1854; d. New York, 30 Dec. 1916. After his family moved to New York he was educated in the old Henry street grammar school in that city. His later education was completed by study at Hanover, in Germany, and at Geneva. He then (1877) became a reporter on the New York *Times,* and later received a roving commission from the *Times* as a political correspondent. While engaged in this political work he became acquainted with the late John H. Starin, whose daughter he married. Some time spent as special correspondent in Washington was followed by his reporting the yellow fever epidemic in the South. He was a close friend of President Arthur, but declined when President Arthur offered to make him his private secretary and later Minister to Belgium. General Carroll for many years never missed a Republican national convention and had a country-wide acquaintance among the Republican leaders, who entertained much respect for his ability. He was chief of artillery in the New York National Guard from 1895 to 1898. During the Spanish-American War he was inspector-general of the New York troops. General Carroll, whose father had died while leading his brigade in the 2d Army corps at the battle of Antietam, was well qualified for his post. While in Hanover he had for three years studied fortification and drilled with the Polytechnic Cadet Corps. General Carroll was a thorough German scholar and was able to use this language in some of his campaign work. His interest in German affairs caused the Kaiser to bestow on him the order of the Red Eagle. He was the author of several books and plays, among his books being 'Twelve Americans, Their Lives and Times,' 'A Mississippi Incident' and 'The American Countess.' General Carroll was president of the Sicilian Asphalt Paving Company and a director in the Boston Asphalt Company, Sicily Asphaltum Company, Ulster Stone Company and the Fultonville National Bank.

CARROLL, John, American prelate: b. Upper Marlborough, Md., 8 Jan. 1735; d. Georgetown, D. C., 3 Dec. 1815. He was a cousin of Charles Carroll of Carrollton and first Roman Catholic bishop in the United States. At the age of 13 he was sent to Europe to be educated. He studied at Saint Omer for six years and later at the University of Louvain. He was professor (1759–71) at Saint Omer's and Liége; then, becoming a Jesuit, he was made prefect of the Jesuit College at Bruges. On the suppression of the Jesuits in 1774, he returned to the United States. In 1784, at the suggestion of Franklin, he was appointed superior of the Roman Catholic clergy in the United States; was made bishop in 1789; and in 1808 was created archbishop of the archdiocese of Baltimore. Georgetown College was founded by Bishop Carroll in 1791. Consult Shea, 'Life and Times of the Most Rev. John Carroll' (New York 1888), being Volume II of his 'History of the Catholic Church in the United States'; Brent, 'Biographical Sketch of the Most Rev. John Carroll' (Baltimore 1843); White's 'Appendix' to Darras' 'History of the Catholic Church.'

CARROLL, John Joseph, American Roman Catholic clergyman: b. Enniscrone, County Sligo, Ireland, 24 June 1856. He came to the United States in infancy, was educated in Saint Michael's College, Toronto, Ontario, and at Saint Joseph's Theological Seminary in Troy, N. Y. He became assistant priest in the Cathedral of the Holy Name, Chicago, in 1880, and subsequently rector of Saint Thomas' Church there. He is a Gælic scholar of prominence and has written 'Notes and Observations on the Aryan Race and Tongue' (1894); 'Prehistoric Occupation of Ireland by the Gælic Aryans' (1908); 'Tale of the Wanderings of the Red Lance' (1909); translation into Gælic verse of 'The Rubaiyat' of Omar Khayyam (1909).

CARROLL, Lewis. See DODGSON, CHARLES LUTWIDGE.

CARROLL, Iowa, city and county-seat of Carroll County, on the Chicago Great Western and the Chicago Northwestern railroads, 98 miles northeast of Omaha, Neb. It has manufactures of tractor engines, wire fencing and wire novelties, etc.; roller and flour mills, ice factory, cream factory, marble, cement and brick works, and owns and operates municipal waterworks. The settlement of Carroll dates from 1867. Pop. (1910) 3,546.

CARROLLTON, Ga., city and county-seat of Carroll County, 50 miles southwest of Atlanta, on the Little Tallapoosa River, and on the Central of Georgia Railroad. It has extensive cotton, fruit and live stock interests and contains flour mills, rolling mills, foundries, cottonseed-oil mills, machine shops, fertilizer works, broom factories, brick and marble yards. The city owns the waterworks. Pop. 3,297.

CARROLLTON, Ill., city and county-seat of Greene County, 55 miles southwest of Springfield, on the Chicago & Alton Railroad. It has a large trade in the products of the region, has flour mills, a public library and a county courthouse. The city operates the water supply system. It was settled in 1819 and laid out in 1821. Pop. 2,323.

CARROLLTON, Mo., city and county-seat of Carroll County, 65 miles northeast of Kansas City, on the Atchison, Topeka & Santa Fé, the Chicago, Burlington & Kansas City and the

Wabash railroads. It has flour mills, wagon and harness factories, foundry and machine shops, agricultural implement works, furniture works and a creamery. It has in addition a poultry-feeding station and is the commercial centre for a thriving agricultural region. It was settled in 1819 and incorporated in 1830. It contains a monument erected by the government to Gen. James Shields. Pop. 3,453.

CARROLLTON, Ohio, village and county-seat of Carroll County, 25 miles southeast of Canton, on the Wheeling & Lake Erie Railroad. It is located in an agricultural region which also has deposits of clay, coal and natural gas. It has manufactories of pottery, rubber, toys, granite and paving brick. The village owns the waterworks. Pop. 1,730.

CARRON OIL, a mixture of equal parts of linseed oil and lime water, much used as a dressing for burns. It has no particular advantages over other simpler and neater dressings, notably vaseline or oxide of zinc ointment. Its name is derived from its use in the Carron Foundry, Scotland.

CARRONADE, an iron gun introduced in 1779 by the director of the Carron Foundry, in Scotland, from which it took its name, said to have been invented in 1752 by General Melville, and first used in the American Revolutionary War. See ORDNANCE.

CARROT, a biennial plant (*Daucus carota*) of the family *Apiaceæ*. It is a native of Europe, introduced into America, and is known as a troublesome weed upon poor land, especially in the eastern United States. It is more favorably known by its cultivated varieties which are said to have been derived originally from Holland prior to the 16th century, since when it has become deservedly popular in all temperate climates. Certain large-rooted varieties are raised for stock feeding. The most popular culinary varieties are small, rapidly growing plants with diversely formed roots. Since they are most used as a flavoring in soups, stews and other dishes which have not become specially popular in America, they are less cultivated here than in Europe. The plants succeed best in a warm, friable, rich soil, well supplied with moisture, free from stones, weeds, etc., and in the best physical condition. The seed may be sown in drills one-half foot apart as soon as the ground has become warm, since they are slow to germinate and since the seedlings are very tiny. A few radish seeds of an early maturing variety are usually planted with them to break the soil and indicate the positions of the rows, so that cultivation may be commenced early. The radishes are pulled when they reach edible size and the carrots given clean cultivation, the plants being thinned to stand two or three inches apart. When they reach edible size they are bunched and marketed. The larger growing kinds are planted in rows 24 to 30 inches apart and the plants thinned to three or four inches. When mature they are stored in pits or root cellars. Few diseases attack the carrot and the few harmful insects are usually controlled by their parasites.

The average percentage composition of carrots is: Water, 88.6; nitrogen-free extract, 7.6; carbohydrate, 1.3; protein, 1.1; fat, a trace; ash, about 1 per cent. They resemble other root and tuber vegetables in their succulence and nutritive value. They are greatly relished by stock, especially horses, but are usually replaced in American rations by cheaper foods.

CARROUSEL, kä-roo-sĕl', formerly an exhibition of various knightly exercises, as riding at the ring, throwing the spear, etc., which were celebrated at the courts of princes on festival occasions with great pomp and splendor. They are very ancient, but are first mentioned in history in 842, on occasion of the meeting held by Charles the Bald and Louis the German. They were superseded by tournaments, but when these had fallen were again revived. Their introduction or revival in France took place after tournaments had fallen out of fashion in consequence of the accident which ended in the death of Henry II. Similar fêtes had already long existed among the Moors, Spaniards and Italians. These exhibitions were common during the continuance of the old French monarchy. The Place du Carrousel in Paris was so called from one of these fêtes given there in 1662, in honor of Mademoiselle de la Vallière. The greatest extravagances were enacted at these displays. Recitations accompanied them, some verse in outrageous taste and full of absurd allegorical personages, being usually recited in honor of the heroine of the fête, although genuine dramatic performances were sometimes given by professional actors. A revival of the carrousel was attempted in Berlin in 1750. In the United States the name carrousel is applied to a merry-go-round, a machine with a revolving circular platform and fixed wooden horses, etc., upon which both children and grown people ride for amusement.

CARRUTH, (Fred) Hayden, American journalist: b. near Lake City, Minn., 31 Oct. 1862. He studied at the University of Minnesota 1881–82, and began his journalistic labors at Minneapolis and afterward had a country newspaper in Dakota 1883–86. He was on the editorial staff of the New York *Tribune* 1888–92; had charge of the Editor's Drawer department of *Harper's Magazine* 1899–1901. Since 1905 he has been on the editorial staff of the *Woman's Home Companion;* is a frequent contributor to many magazines, such as *Youth's Companion, Saturday Evening Post, Collier's, Century,* etc. He has published 'The Adventures of Jones' (1895); 'The Voyage of the Rattletrap' (1897); 'Mr. Milo Bush and Other Worthies' (1899); 'Tracks' End' (1911).

CARRUTH, William Herbert, American scholar and author: b. Osawatomie, Kan., 5 April 1859. He was educated in the University of Kansas and at Harvard, and was professor of German in the former institution from 1887 to 1913. Since 1913 he has been professor of comparative literature and head of the English department at Stanford University. He has published 'Schiller's Wallenstein with Introduction and Notes' (1894); 'Scheffel's Ekkehard' (1895); 'Schiller's Wilhelm Tell' (1898); 'Auswahl aus Luther's Deutschen Schriften' (1899); 'Schiller's Die Braut von Messina' (1901); 'Otis' Elementary German Grammar' (1904); 'German Reader' (1904); 'Letters to American Boys' (1907); 'Each in His Own Tongue and Other Poems' (1909); translator of Cornill's 'History of the People of Israel' (1898) and Gunkel's 'Legends of

Genesis'; and is a contributor to philological journals and literary magazines.

CARRYING-TRADE, a phrase used in political economy and also in commercial transactions. It usually refers to the commerce of different countries with each other, and is most frequently applied to carriage by sea. In a purely commercial sense the carrying-trade is simply the carriage of commodities from one place or country to another, irrespective of the mode of conveyance. In political economy the term is used in a special and restricted sense. In considering the entire commerce of a country it may be found that a part of that commerce is not directly with any one foreign country, but consists in supplying facilities for the conveyance of goods from one foreign country to another. The ships of the United States, for example, may be employed in carrying goods between India and China. This is called a carrying-trade. The carrying-trade does not consist merely in the occasional charter of vessels to foreign merchants for a foreign voyage. Though this may be included in it, its regular organization implies more than this. A ship-owner, instead of lending his vessels incidentally to foreign merchants, may build or purchase them expressly for the purpose of conveying goods between different foreign ports at his own risk, and may even invest capital in merchandise to be so conveyed. It is to this abnormal development of commerce that the term carrying-trade in its restricted sense is applied. It is an investment of capital common in the case of commercial communities which have acquired great surplus wealth, or from the limited range of their territory have few home investments. From the earliest time the principal commercial communities, especially the great trading cities of antiquity and those of the Middle Ages which have formed communities in themselves, have embarked largely in this kind of commerce.

CARSON, Christopher, popularly known as Kit Carson, American mountaineer, trapper and guide: b. Madison County, Ky., 24 Dec. 1809; d. Fort Lyon, Colo., 23 May 1868. While yet an infant his family emigrated to what is now Howard County, Mo. At 15 years of age he was apprenticed to a saddler, with whom he continued two years, when he joined a hunting expedition. The next eight years of his life were passed as a trapper, which pursuit he relinquished on receiving the appointment of a hunter to Brent's fort, where he continued for eight years more. At the expiration of this time, he chanced to meet Frémont, by whom he was engaged as guide in his subsequent explorations. In 1847 Carson was sent to Washington as bearer of dispatches, and received an appointment as lieutenant in the rifle corps of the United States army. In 1853 he drove 6,500 sheep to California, a difficult but successful undertaking, and on his return to Taos was appointed Indian agent in New Mexico. He served in the Federal army during the Civil War, attaining the rank of brevet brigadier-general. Consult Bradley, 'Winning the Southwest' (New York 1912); Sabin, 'With Carson and Frémont' (Philadelphia 1912).

CARSON, Sir Edward Henry, Irish Unionist leader: b. Dublin, 9 Feb. 1854. He was educated at Trinity College, Dublin, was called to the Irish bar in 1889, and became solicitor-general for Ireland 1892. He was called to the English bar in 1894; and was solicitor-general for England in the Unionist administrations 1900–06. He became very prominent during the passage of the Irish Home Rule Bill in 1912; organized the resistance of Ulster to that measure; inaugurated and was the first to sign the Solemn League and Covenant which pledged the Ulster Protestants to resist, by force of arms if necessary, submission to a Dublin Parliament; and he was the head of the provisional government nominated in 1913 to administer the province in that event. This work of organization and the ensuing political campaign entailed enormous inroads on his time and strength, and in order to carry it through he surrendered a great practice at the bar that was yielding him an income of $100,000 a year. For a time it appeared as if civil war might be the issue; when the Great European War intervened to put an end, for a time at least, to factional strife in Ulster; and Sir Edward's energies became devoted to stimulating the government to stronger measures with a view to winning the war. He became Attorney-General in the Asquith Coalition Government in June 1915, but resigned on 18 October following, owing to divergencies of view, mainly on the Balkan question. He negotiated with Mr. Lloyd-George and Mr. Redmond the provisional agreement on the Irish question, which, as modified by the Cabinet, was repudiated by the Nationalist members, and subsequently withdrawn. On the occasion of that withdrawal, on 24 July, he made in the House of Commons what was perhaps the greatest speech of his life, and one which showed that the European War had sensibly altered his horizon when he declared that it would be a good thing for Ireland if he and Mr. Redmond could shake hands on the floor of the House, and gave a contingent hint that Ulster might become reconciled to Home Rule and desire inclusion, if she saw the rest of Ireland well governed by a Dublin Parliament.

CARSON, Hampton Lawrence, American publicist: b. Philadelphia, Pa., 21 Feb. 1852. He was graduated at the University of Pennsylvania in 1871, and became a lawyer, rising speedily to prominence by speeches and addresses on topics of the time. He has written 'History of the Supreme Court of the United States'; 'The Law of Criminal Conspiracies as Found in American Cases'; 'History of the One Hundredth Anniversary of the Promulgation of the Constitution of the United States'; also many papers in law journals and addresses. He is a lecturer on law at the University of Pennsylvania.

CARSON CITY, Nev., city, capital of the State and county-seat of Ormsby County, on the Virginia & Truckee railroad, 32 miles southeast of Reno. The city is in a mining and agricultural district, and is the location of a branch mint, a Federal building, State capitol, State prison, an orphans' home and an Indian school. The business is mainly connected with mining, agriculture and lumbering. Here are railroad and machine shops, etc. Carson City is only 12 miles from Lake Tahoe, and on account of its beautiful scenery at the base of the Sierra

Nevada is a popular summer resort. The State prison is two miles southeast of the city, and a United States government Indian school is three miles to the south. Founded in 1858, it became the capital of Nevada in 1861 and was chartered as a city in 1875. Pop. 2,500.

CARSON RIVER, a river of Nevada, rising in the Sierra Nevada and flowing northeast for about 150 miles. It then divides, and the main branch flows into Carson Lake, a small lake with no apparent outlet. The other branch flows in the opposite direction and is lost in Carson Sink.

CARSTAIRS, or **CARSTARES, William,** Scottish clergyman of political eminence: b. Cathcart, near Glasgow, 1649; d. 1715. He pursued his studies at the universities of Edinburgh and Utrecht. He returned to Scotland with the view of entering the ministry, but after receiving a license to preach resolved to return to Holland. As he was to pass through London, he was employed by Argyle and his party to treat with the English exclusionists and became privy to the Rye-house plot. On the discovery of that conspiracy he was apprehended. After a rigorous confinement in irons he was subjected to the torture and endured this trial with great firmness; but being afterward deluded with the hopes of a full pardon, and assured that his answers should never be made evidence against anyone, he submitted to make a judicial declaration. Being released he returned to Holland, and was received by the Prince of Orange as a sufferer in his cause. The Prince made him one of his own chaplains and procured his election to the office of minister of the English congregation at Leyden. He accompanied the Prince in his expedition and always remained about his person, both at home and abroad. During this reign he was the chief agent between the Church of Scotland and the court, and was very instrumental in the establishment of Presbyterianism, to which William was averse. On the death of William he was no longer employed on public business; but Anne retained him as her chaplain-royal and made him principal of the University of Edinburgh. When the union of the two kingdoms was agitated he took a decided part in its favor. The memory of Carstairs is for the most part revered by his countrymen as that of an enlightened patriot; and few men of active power and influence have steered between parties more ably and beneficially. Consult McCormick, «Life of Carstairs,» prefixed to ‹State Papers and Letters Addressed to William Carstairs› (London 1774); and Story, ‹Character and Career of William Carstairs.›

CARSTENS, Asmus Jakob, Danish painter: b. Saint Jürgen, near Schleswig, 10 May 1754; d. 26 May 1798. He was a miller's son, but received a superior education from his mother. He had a youthful passion for painting, but after his mother's death was placed in a mercantile house. After quitting his master, he went to Copenhagen, where he struggled on for seven years, supporting himself by portrait painting, at the same time working on a large historical picture on the ‹Death of Æschylus.› He went to Italy after finishing this work, then lived at Lübeck for five years, toiling on in obscurity, when he was introduced by the poet Overbeck to a wealthy patron, by whose aid he went to Berlin, where the merit of his ‹Fall of the Angels,› a colossal picture, containing over 200 figures, gained him a professorship in the Academy of Fine Arts. Two years' labor in Berlin enabled him to accomplish his cherished wish to go to Rome and study the works of Michelangelo and Raphael. His best works were designs in aquarelle and painting in fresco; he rarely painted in oil. His cartoons at Weimar have been engraved by Müller. Homer, Pindar, Aristophanes and Dante supplied him with his best subjects; and among the painters who endeavored to infuse a classic spirit into the fine arts of the 18th century, he holds a prominent position. His works are distinguished by correctness of form and outline, gracefulness of attitude and loftiness and vigor of expression; but they frequently exhibit a certain harshness, arising from too close imitation. He was often defective in anatomy and perspective and, having begun late to paint in oil, was unacquainted with the secrets of coloring. Consult Fr. Pauli, ‹A. Carstens› (Berlin 1876) and Fernow, ‹Carstens Leben und Werke› (new ed. by Riegel, Hanover 1867).

CART (A. S. *craet,* Gaelic *cairt;* connected with «car»), a carriage with two wheels, fitted to be drawn by one horse or other animal and used in husbandry or commerce for carrying many sorts of goods. There are various descriptions of carts used in agriculture, and for many kinds of agricultural work the cart is preferable to the wagon. The ordinary cart for heavy goods has no springs, but there are many carts provided with springs. In France and Germany, the carrier's cart is built to carry heavy loads. Other varieties of cart are the dump cart, constructed so that it can be emptied by tilting the body; the dogcart, originally used for conveyance of sporting dogs; gadabout, a lower form of dogcart; the whitechapel cart, for tandem driving; the gig, with a single seat; the Canadian calash, with a low seat for the driver; the trotting sulky, used with race-horses; and numerous road carts.

CARTAGENA, kär-tą-jē'nä, Colombia, capital of the department of Bolivar, founded 21 Jan. 1533, by Pedro de Heredia. Early in the 17th century it ranked next below Mexico among the cities of the Western world, and was called «Queen of the Indies.» At that time its inhabitants numbered about 20,000, of whom 3,000 were Spaniards; it was strongly fortified, and one of the main entrepôts of commerce between the hemispheres — a distinction due, in part, to its proximity to the Isthmian route, but even more to the excellence of its harbor, which is one of the best on the northern coast of South America. As the principal stronghold of Spanish America, it was repeatedly attacked: by a French fleet in 1544; by the English under Drake in 1585; again by the French in 1697; and by the English under Vernon in 1741. The town remained Spanish until 1815, when Bolivar took it; but the same year it was surrendered to the royalists, after a memorably heroic defense; and finally it was taken by Republican forces 25 Sept. 1821. Its population at present is little more than one-half the number accredited to it three centuries ago. Cartagena is situated in lat. 10° 25′ 48″

N., long. 75° 34′ W. Its temperature averages 82° F., and its location is unhealthful. The city is surrounded by the old fortifications and possesses a cathedral, two fine churches, a government building, a college, seminary and a theatre. The town manufactures chocolate and candles, and exports cattle, hides, fine woods, precious stones and tobacco. Pop. 14,000.

CARTAGENA, Spain, a city and fortified seaport and naval arsenal in the province of Murcia, and 27 miles south-southeast of the city of Murcia. Its harbor is one of the largest and safest in the Mediterranean. The city, located at the northern end of the harbor, is surrounded by a lofty wall, flanked with bastions. The principal buildings are the cathedral dating from the 13th century, now converted into a simple parish church; the old castle, supposed to date from the foundation of the city by the Carthaginians; the barracks, arsenal, presidio or convict establishment, the military hospital, the Hospital de Caridad, the artillery park, the observatory, the convents of Saint Augustine and Monjas, and several other convents and churches. Great improvements have been made recently in the accommodation for shipping by the construction of moles, wharves, breakwaters and a floating dock. Lead smelting is largely carried on; and there are also in the neighborhood rich mines of excellent iron, which are connected with the harbor by means of a tramway about eight miles in length. Esparto grass, compressed by hydraulic power, is largely shipped; other exports are metallic ores, wine and fruit. Timber, coal and codfish are the principal imports. Cartagena (ancient Carthago Nova) was founded by the Carthaginians about 228 B.C., and it was the Carthaginians who first worked the copper mines. It was taken by Scipio Africanus 210 B.C., and afterward became a Roman colony. In 425 A.D. the Vandals largely destroyed it; and in 711, after having been in possession of the Visigoths, it again suffered destruction at the hands of the Saracens. Under them it became an independent principality, which was conquered finally by James I of Aragon in 1276. In 1585 it was sacked by the English fleet under Sir Francis Drake. When Spain possessed her colonies and was in a flourishing condition, Cartagena was one of her most important naval stations and carried on a very extensive commerce. In 1873 a body of communists obtained possession of the city and fortifications, but they were compelled to surrender in the following year. Pop. (1911) 102,542. In 1870 the population was 26,000.

CARTAGO, kär-tä′gō, Colombia, town in the valley of the Cauca, 150 miles west of Bogota on the Viega, a tributary of that river. Its trade is principally in dried beef, pigs, fruits, coffee, cacao and tobacco. The sugar-cane thrives well here. Cartago is the entrepôt for the trade of Santa-Fé-de-Bogotà. The climate is hot, but dry and healthful. Pop. about 10,000.

CARTAGO, Costa Rica, city, formerly capital of Costa Rica, now capital of the province of Cartago, on the right bank of a river of its own name, 14 miles east-southeast of San José. It was once a place of considerable commercial importance, and had a population of about 37,000. It was so ruined by an earthquake 2 Sept. 1841, that only 100 houses and a church were left standing. It had already been superseded both as a capital and a seat of commerce by San José. The railroad from San José to Limon passes through it. Near the town are the springs of Aguacaliente, and also Mount Cartago or Irazu, an active volcano, rising 11,480 feet above the sea-level. The town has a considerable coffee trade, and derives much importance from its position on the inter-oceanic railway. Pop. about 4,536.

CARTAS OF FEIJÓO. The ‹Cartas› (Letters) and ‹Teatro crítico universal› (Treasury of Universal Criticism) of the Benedictine monk Benito Gerónimo Feijóo y Montenegro, constitute collectively one of the most important contributions made to Spanish thought during the 17th century, the period of its awakening from the political and intellectual stagnation consequent upon the collapse of the Hapsburg dream of world dominion. They are associated with the earlier days of Spanish journalism, when miscellanies of encyclopædic character had not yet given way before the periodical press. The ‹Letters,› as well as the essays of the ‹Teatro crítico,› a prior and more vigorously written work, cover a wide range of topics, from natural history and the then known sciences, education, history, religion, literature, philology, philosophy and medicine, down to superstitions, wonders and salient points of contemporary journalistic interest, all in a spirit of candor and cool judgment, which proved to be of decisive influence in the assault upon 18th century Peninsular scholasticism. The style, especially in the letters, is encumbered by the prolixity of formal eloquence, while philologists have questioned its purity. Nevertheless, Feijóo's was a comprehensive, catholic mind, familiar with the European thought of his day to an extent unprecedented among his countrymen. In temper and content, Feijóo is suggestive of the inchoateness of Montaigne, with his mixture of the rational and the fabulous, rather than of the polished sophistication of Addison and Steele. His fame spread quickly throughout Europe, but in the advancement of learning, his writings have been relegated to a place of mere historical interest. It has been commonly said that a monument should be erected to Feijóo, at the foot of which all his works should be burned. The ‹Teatro› was first published at Madrid (1726–41) the ‹Cartas› at the same city (1742–60). In the edition of 1777 they occupy nine and five volumes respectively, to which three supplementary volumes must be added. A modern reprint occurs in volume 56 of the ‹Biblioteca de Autores Españoles,› with an introduction by Vicente de la Fuente. Consult also Bazán, Emilia Pardo, ‹Feijóo.›

JOHN GARRETT UNDERHILL.

CARTE, Thomas, English historian: b. Clifton-upon-Dunsmoor, Warwickshire, April 1686; d. near Abingdon, 2 April 1754. He was educated at University College, Oxford, and Cambridge, where he received his M.A. in 1706. He took holy orders in 1707 and was appointed reader at Abbey Church, Bath; on account of his allegiance to the Stuarts he resigned. His first publication was entitled ‹The Irish Massacre Set in a Clear Light, etc.,› in which he defended Charles I. from the common charge of secretly instigating the rebellion and massacre in Ireland in 1641. During the rebellion of 1715, a warrant was issued for his apprehension, which he eluded by concealment; and later when it was supposed that he was concerned in a conspiracy, and a reward of £1,000 was offered for his capture, he escaped to France. Here he collected material for an English edition of the 'History of Thuanus' (de Thou). At length Queen Caroline procured leave for his return to England. His important work, the 'Life of James, Duke of Ormonde,' was published in 1735–36, and gained him great reputation, especially with the Tory party. In 1744 he was arrested on a suspicion of being employed by the Pretender, but was discharged. His other works include illustrations for the 'History of Thuanus' (edited by S. Buckley, 7 vols., 1733). He published three volumes of his 'History of England' between 1747 and 1752, the fourth, which brought down the history to 1654, not appearing until after his death. The character of this work is deservedly high for research. Numbers of his manuscripts are preserved in the Bodleian Library, Oxford. Hume and other historians have been indebted to it, but the prejudices of the author are everywhere conspicuous. Consult Nichols, 'Literary Anecdotes' (Vol. II, London 1812–15), and his 'Literary Illustrations of Literary History' (London 1817–58, Vol. V. pp. 152–56).

CARTE BLANCHE, kärt blänch, a blank sheet of paper with an authoritative signature, to be filled up with such conditions as the person to whom it is given may think proper; hence absolute freedom of action.

CARTE DE VISITE, kärt dė vē-zēt, literally a visiting card, a photographic likeness executed on a card somewhat larger than a visiting card, and usually inserted in a photograph album. For an historical account of these "Cartes," consult 'La Grande Encyclopédie' (Vol IX, pp. 568–69).

CARTEL, an agreement for the delivery of prisoners or deserters; also, a written challenge to a duel. A cartel-ship is a ship commissioned in time of war to exchange prisoners; also to carry proposals between hostile powers, and is not permitted to carry instruments of warfare.

CARTER, Elizabeth, English poet and linguist: b. Deal, 16 Dec. 1717; d. London, 19 Feb. 1806. She was the daughter of Dr. Nicholas Carter, a clergyman of Kent, and was educated by her father, soon becoming master of Latin, Greek, French and German; to which she afterward added Italian, Spanish, Portuguese, Hebrew and Arabic. She was for 50 years the friend of Dr. Johnson to whose *Rambler* she contributed two papers. Several of her poetical attempts appeared in the 'Gentleman's Magazine' before she attained her 17th year, and these procured her much celebrity. In 1739 she translated the critique of Crousaz on 'Pope's Essay on Man,' and in the same year gave a translation of Algarotti's explanation of the Newtonian philosophy. She published a translation of 'Epictetus,' in 1758.

CARTER, Franklin, American educator: b. Waterbury, Conn., 30 Sept. 1837. He was educated at Yale, at Williams and at the University of Berlin, and received many honorary degrees. He began his professional career at Williams, where he was professor of French and Latin 1865–68 and of Latin 1868–72. In 1872 he became professor of German at Yale, and during this period studied theology and was licensed to preach. In 1881 he was chosen president of Williams College and administered the affairs of this office with signal ability until 1901, when he resigned. He lectured on Theism in Williams College 1904–10, and is president at the Clarke School for the Deaf since 1896; fellow of the American Academy of Arts and Sciences. He published 'Life of Mark Hopkins' (1892); and a translation of Goethe's 'Iphigenia in Tauris' (1870).

CARTER, Sir Frederic Bowker Terrington, Newfoundland jurist: b. Saint John's, Newfoundland, 12 Feb. 1819; d. Saint John's 28 Feb. 1900. He was called to the Newfoundland bar in 1842, served in the Newfoundland assembly from 1855 to 1878, and two years later became chief justice of Newfoundland. He was created K.C.M.G. in 1878.

CARTER, George Robert, American politician: b. Honolulu, Hawaii, 28 Dec. 1866; was educated at Phillips Andover College and Yale University. In 1891 he was appointed Hawaiian consul at Seattle, Wash. He returned to Honolulu in 1896 and was governor of Hawaii by appointment of President Roosevelt 1903–07.

CARTER, Henry. See LESLIE, FRANK.

CARTER, James Coolidge, American lawyer: b. Lancaster, Mass., 14 Oct. 1827; d. New York, 14 Feb. 1905. He was educated at Harvard, and his admission to the bar took place in New York in 1853. He was counsel for the city of New York in the famous case of the people against William Tweed, and in 1875 was appointed a member of the commission to devise a system of municipal rule for the cities of the State of New York. In 1892, he shared as counsel in representing the claims of the United States to the Bering Sea tribunal. He published 'The Proposed Codification of Our Common Law' (1883); 'The Provinces of the Written and the Unwritten Law' (1889); 'The Ideal and Actual Law' (1890); 'Law: Its Origin, Growth and Function' (1907).

CARTER, James Madison Gore, American author, teacher, lecturer: b. Johnson County, Ill., 15 April 1843. He was educated at the State Normal University, Saint John's College and Northwestern University Medical School. He served in an Illinois regiment during the Civil War, being captured and taken to Libby Prison. Was professor of pathology and hygiene 1891–95; clinical and preventive medicine 1895–99; professor emeritus since 1900, at the College of Physicians and Surgeons, Chicago. Among his works are 'Outlines of Medical Botany of the United States' (1888); 'Catarrhal Diseases of the Respiratory Organs' (1895); and 'Diseases of the Stomach' (1902); and various monographs on medical and literary topics.

CARTER, Jesse Benedict, American classicist: b. New York city, 16 June 1872. He studied at New York and Princeton universities, at Berlin, Leipzig, Göttingen and Halle.

From Latin instructor in 1895 and assistant professor in 1898, he became professor in 1902 at Princeton University. He had lectured on Roman religion at the University of Wisconsin in 1900, and in 1904 was appointed professor of Latin at the American School of Classical Studies in Rome, three years later (1907) being made director. His published writings include 'De Deorum Cognominibus' (1898); 'The Roman Elegiac Poets' (1900); 'Epitheta Deorum' (1902); Virgil's 'Æneid' (1903); 'The Religion of Numa' (1906); 'The Religious Life of Ancient Rome' (1911), etc. He also translated Huelson's 'Forum' (1906), and wrote a 'Memorial Service to J. Pierpont Morgan' (1913).

CARTER, Louise Leslie, American actress: b. Lexington, Ky., 1862. Her stage career began 10 Nov. 1890, when she appeared in the 'Ugly Duckling' in New York. Her other rôles have been the Quakeress in 'Miss Helyett'; Maryland Calvert in 'The Heart of Maryland'; Zaza in 'Zaza'; Madame Du Barry in 'Du Barry'; and Adrea in 'Adrea.' She was married to William L. Payne 13 July 1906. Consult Strang, 'Famous Actresses.'

CARTER, Samuel Powhatan, American naval and military officer; b. Elizabethtown, Tenn., 6 Aug. 1819; d. Washington, D. C., 26 May 1891. After attending Princeton for a short time he became a midshipman in 1840, fought in the Mexican War in coast attack, and in 1856 took part in the capture of the barrier forts, Canton, China. In 1861 he was detailed to go to Tennessee, where he started the Tennessee brigade. All through the Civil War he was of great service to the government, and for his gallantry was brevetted major-general of volunteers. He returned to the navy and from 1869–72 was commandant of the Naval Academy at Annapolis. In 1882 he was promoted rear-admiral on the retired list.

CARTER, Thomas Henry, American politician: b. Scioto County, Ohio, 30 Oct. 1854; d. 1911. He was bred to farming, but later became a lawyer, removing to Montana in 1882. He was Montana's first representative in Congress (1891), United States senator from that State from 1895 to 1901, chairman of the National Republican Committee in 1892–96, and was appointed in 1900 United States commissioner to the Saint Louis Exposition. He served a second time as United States Senator in 1905–11, and in the latter year was appointed a member of the international boundary commission of the United States and Canada. In 1901 he spoke for 16 hours against the river and harbor bill with appropriations for $50,000,000.

CARTER, William Harding, American army officer and author: b. Nashville, Tenn., 19 Nov. 1851. He is a graduate of the United States Military Academy, West Point, N. Y.; was on duty on the Western frontier, 1873–97; promoted from captain of cavalry, by selection, to major and assistant adjutant-general, and to duty at War Department, 1897–1902; promoted from colonel to brigadier-general and duty on the War College Board 1902–03. He was a member of the General Staff to 31 Dec. 1903; was sent to England and Europe to investigate remount systems 1903. He has held the following commands: Department of Visayas, Philippine Islands 1904–05; Department of Lakes 1906–08; provisional division, manœuvers, regulars and national guard, 1906–08; Department of Missouri, 1908–09. He was promoted to major-general, 13 Nov. 1909; Department of Luzon, Philippine Islands 1909–10; to the General Staff, 1910–12; Manœuvre Division, Texas, 1911; Central Division, 1912–13; Central Department, 1913–14; Second Division (Mobile Army) Texas, 1913; Hawaiian Department, 1914–15; retired from active service, 19 Nov. 1915. He received medal of honor «for distinguished bravery in action,» and is author of 'The American Army'; 'From Yorktown to Santiago with the Sixth Cavalry'; 'Old-Army Sketches'; 'Horses, Saddles and Bridles'; 'Giles Carter of Virginia' (genealogical memoir).

CARTER-COTTON, Francis L., Canadian editor and statesman: b. Yorkshire, England, 1847. After early education in England, he emigrated to Canada, and settled at Vancouver, B. C., where he founded the *Daily News-Advertiser* in 1886 and became its editor. A Conservative, he was elected a member of the British Columbia legislature in 1890, and was appointed minister of finance 1898–1900; a position to which his writings and speeches on financial and economic questions added considerable weight. He was chief commissioner of lands and works (1906–10), and subsequently president of the council. He was elected first chancellor of the University of British Columbia in 1902, and in 1906 endowed a professorship of pure and applied mathematics in the McGill University College of British Columbia.

CARTERET, kär'te-rā, **Antoine Alfred Desire,** Swiss statesman and fabulist: b. Geneva, 3 April 1813; d. there, 29 Jan. 1889. His political career was long and brilliant; and in literature he made a name with pleasing 'Fables' (1873), and a novel, 'Two Friends' (1872), descriptive of Genevese customs. For the history of his political career see 'La Grande Encyclopédie' (Vol. 9).

CARTERET, kăr'te-rĕt, Sir **George,** English provincial proprietor: b. Saint Ouen, Jersey, between 1609–17; d. 14 Jan. 1680. He had a distinguished career in the British navy, was an active supporter of the royalist cause, was made lieutenant-governor of the island of Jersey and vice-admiral. He manifested an interest in colonization and received a royal grant, «in perpetual inheritance,» of certain lands in America «to be called New Jersey,» the name being taken from the island of which he had been governor. In 1651 he surrendered to the Commonwealth and served for a time in the French navy, returning to England at the Restoration. He was made treasurer of the navy in 1661 and suspended in 1669 for mismanagement of funds. Nevertheless he was appointed deputy treasurer of Ireland in 1667 and continued in royal favor. In 1664 he was made joint proprietor with Lord Berkeley of the province of New Jersey under a grant from the Duke of York, and in 1676, when the province was divided, East Jersey fell to his share. He was one of the first proprietors of Carolina.

CARTERET, John, Earl Granville, British statesman: b. 22 April 1690; d. Bath, 2 Jan. 1763. He received his education at Westminster School and Christ Church College, Oxford. From Oxford he proceeded to London, plunged into the political and social excitements of the period, made the acquaintance of Swift and in 1710 married Lady Frances Worsley. Entering the House of Lords on 25 May 1711, as second Baron Carteret, he espoused the side of the Whigs, then led by Stanhope and Sunderland, and in 1714 made his first speech in the House of Lords in support of the Protestant Succession. On the accession of George I Carteret became a lord of the bedchamber. In 1719 he was appointed by Stanhope Ambassador Extraordinary to Sweden, and succeeded in arranging two treaties of peace, the first between Sweden, Hanover and Prussia, and the second between Denmark and Sweden. In 1721 he was appointed to one of the two foreign secretaryships, that for the «Southern Department» of Europe, and as such, attended, in 1723, the congress of Cambria, which attempted the settlement of differences between Germany and Spain, and accompanied George I to Berlin. In 1724 Carteret was appointed lord lieutenant of Ireland. Though he came into collision with Swift over the Drapier prosecution, the two ultimately became warm friends. Between 1730 and 1742 Carteret took the lead in the House of Lords of the party opposed to Sir Robert Walpole. When this opposition succeeded in overthrowing Walpole, Carteret became the real head of the administration, but was driven from power by the Pelhams in 1744. In the same year he became Earl Granville on the death of his mother, who had been created Countess Granville in her own right. In 1749 he became Knight of the Garter, and from 1751 to his death was lord president of the council under Henry Pelham. Consult Ballantyne, ‹Lord Carteret: A Political Biography› (London 1887); Lecky, ‹History of England in the 18th Century› (New York 1878–91); and Mahon, ‹History of England› (Vols. II–IV, London 1836–54).

CARTERET, Philip, English provincial governor: d. 1682. He was appointed governor of the province of New Jersey by the proprietors, Berkeley and George Carteret, and was given power to grant land to settlers. He reached New Jersey in 1665, bringing with him about 30 settlers, and settled at Elizabethtown. He avoided trouble with the Indians by adopting the wise policy of buying the land from them or requiring the colonists to do so. In 1672 he went to England for a time, but returned in 1674, and during his absence New Jersey was in the possession of the Dutch for a year, 1673–74. In 1676 when the division of the province into East and West Jersey was completed he became governor of East Jersey, holding the position till his death, although the office was contested by Sir Edmund Andros, governor of New York, who demanded control of New Jersey as well.

CARTERVILLE, Ill., city in Williamson County, 100 miles southeast of Saint Louis, on the Illinois Central and the Saint Louis, Iron Mountain and Southern railroads. Coal mining is the principal industry. Pop. 2,971.

CARTERVILLE, Mo., city of Jasper County, on the Frisco and the Missouri Pacific railroads, 10 miles southwest of Carthage, the county-seat. Carterville was founded in 1875 in a rich lead-mining and zinc silicate-bearing region and has smelters, foundry and machine shops, iron works, boiler works and stone quarries. Pop. (1910) 4,539.

CARTERSVILLE, Ga., city and county-seat of Bartow County, 45 miles northwest of Atlanta, on the Seaboard Air Line, the Western and Atlantic and the Nashville, Chattanooga and Saint Louis railroads. The city is the centre of a region producing cotton, fruit and grain in abundance and of a mining district with rich deposits of gold, graphite, iron, manganese, ochre and other minerals. The industrial establishments comprise cottonseed-oil mills, fertilizer works and cotton mills. The city has a county courthouse and a public library. The electric-lighting plant and waterworks are the property of the municipality. The commission form of government was adopted in 1911. Pop. 4,067.

CARTESIANISM, the philosophy of René Descartes (q.v.) and his school, among whom may be reckoned Geulincx, Malebranche, Arnauld, Nicole, and even many who stood outside the circle of professional philosophers like Bossuet and Fénélon. Spinoza and Leibnitz have much in common with Descartes in standpoint and method, but the divergencies of their systems from his are too great to justify us in classifying them as Cartesians. Among the many noteworthy points in Descartes' system we may mention the deliberate determination to doubt everything that could intelligibly be called in question. This was not scepticism, but a principle of method that he employed to enable him to reach something absolutely certain. This basal fact he found in the famous proposition, «I think, therefore I am» (*Cogito ergo sum, je pense donc je suis*). No doubt could shake the certainty the ego possesses of its own existence. Moreover, Descartes finds in consciousness certain ideas that are not due to experience and not the product of the imagination. These ideas he pronounces connate, original possessions of the mind. Among them the chief is that of the conception of God as an infinite and all-perfect being. Now the presence of this idea, Descartes argues, proves the actual existence of God as its cause, for no finite being can be the author of the idea of infinity. Having thus established the existence of God, Descartes maintains that the veracity of God warrants us in believing that whatever we perceive through the medium of clear and distinct ideas must be true. Adopting the traditional notion of substance he holds that besides the infinite substance, God, there are two finite created substances, namely, matter or extended substance, and mind or thinking substance. These have no attributes in common, and are absolutely opposed to each other. Thus his philosophy is a Dualism (q.v.). In the human organism these two substances are united. The soul has its seat in the pineal gland, and at this point receives influences from the body, and in turn controls and governs the direction of bodily movements. Descartes' account of the physical world is given in terms of the mechanical theory, the principles of which he was one of the earliest thinkers to formulate clearly. All bodies are extended, figured, substances, without any internal properties or differences. Everything that takes place in the physical world consists in the movement of an extended body. Thus the sciences of physical nature can be comprehended in a mathematical physics which has for its data the size, shape, velocity (amount of motion) and direction of the various bodies of which the physical world is composed. God at the beginning created bodies with a fixed quantity of motion and rest; and since God is unchanging, this amount is subject to no increase or diminution. From this statement, which is couched in scholastic language, has come, through a closer analysis of conceptions, the modern principle of the conservation of energy. Descartes' view of the relation of body and mind was not satisfactory even to the members of his own school, and led to the doctrine of Occasionalism and with Spinoza to a thorough-going Parallelism (q.v.). He also left to his successors the further elaboration of the problem regarding the relation of the one infinite substance, God, to the two created substances. In the 'Passions de l'âme' he made an important contribution to the psychology of the emotions, deriving all forms of emotional experience from the six primary emotions, wonder, love, hate, desire, joy and grief.

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CARTHAGE (conjectural native name, the Phœnician *Kereth-hadeshoth*, new city, from which the Greek *Karchēdon*, and the Roman *Carthago* are supposed to have been derived), the most famous city of Africa in antiquity, capital of a rich and powerful commercial republic. It was situated on the north coast, not far from the modern Tunis. According to tradition, Dido, fleeing from Tyre, came to this country, where the inhabitants agreed to give her as much land as could be compassed by an ox-hide. Dido cut the hide into small thongs, with which she enclosed a large piece of land. Carthage was founded, according to Aristotle, 287 years later than Utica. Becker supposes it to have been a joint colony or factory, in the Anglo-Indian sense, of Tyre and Utica. The actual date of its foundation is much contested. The date commonly given is 878 B.C. The history of Carthage is usually divided into three periods. The first is the epoch of its gradual rise; the second that of the struggles with other states occasioned by its extended power; the third that of its decline and fall. These epochs interlock each other, and it is only as a matter of convenience that we can interpose exact dividing dates between them. The first epoch has been extended as far as to 410 B.C.; the second limited to the period chiefly distinguished by wars with Greece, 401–265; the third is the period occupied with the Roman wars, and ending with the fall of Carthage.

Carthage appears early to have been independent of Tyre. There existed, however, a close relationship between them, due to affinity of race and religion. This appears from various incidents in their history, as when the Tyrians refused to follow Cambyses in a contemplated attack on Carthage, and when Alexander, having attacked Tyre, the women and children were sent to Carthage. There is no evidence that the government of Carthage was ever monarchical. She appears soon to have acquired an ascendency over the earlier Tyrian colonies, Utica, Tunis, Hippo, Leptis and Hadrumetum. This was probably gained without any effort as the result of her material prosperity. The rise of Carthage, then, may be attributed to the superiority of her site for commercial purposes, and the enterprise of her inhabitants. Her relations with the native populations, as is evident from her subsequent history, would always be those of a superior with inferior races. Some of them were directly subject to Carthage, others contributed to her strength by recruiting her armies, although frequently in hostility with her. She established colonies for commercial purposes along the whole northern coast of Africa, west of Cyrenaica, and these colonies enabled her to maintain and extend her influence over the native tribes. These colonies, together with most of the earlier Phœnician colonies subject to her, possessed little strength in themselves, and easily fell a prey to an invader; hence they were in the end a source of weakness, although it is not easy to see how her prosperity could have been attained without them. It is only after the north of Africa has thus been placed at her command that Carthage appears formally on the stage of history. One of her earliest recorded contests is that with Cyrene, when the boundary between the two states was fixed, to the advantage of Carthage, at the bottom of the Greater Syrtis, the Carthaginian envoys, according to the traditional story, consenting to be buried on the spot. The immediate wants of the city were provided for by the cultivation of the surrounding territory, which alone was directly dependent on her.

Commerce naturally led Carthage to conquest. The advantages, both for the promotion and protection of her trade, of possessing islands in the Mediterranean, led to her first enterprises. Expeditions to Sicily and Sardinia appear to have been undertaken before the middle of the 6th century. The war was carried on in the latter half of this century by Mago and his sons Hasdrubal and Hamilcar. At the same time a war arose with the Africans on account of the refusal of the Carthaginians to continue the payment of a ground-rent for their city. In this the Carthaginians were unsuccessful, but at a subsequent period they achieved their object. Sardinia was their first conquest. They guarded it with the utmost jealousy. The Romans, by the first treaty 509 B.C., were allowed to touch at it; but this permission was withdrawn in the second. It was the entrepôt of their trade with Europe, and lessened their dependence on their own territory for corn. They founded its capital, Caralis, now Cagliari. They soon after occupied Corsica, where they united with the Tyrrhenians, its previous possessors, against the Greeks. Sicily was already occupied by

Greek and Phœnician colonies. The latter, on the decline of Tyre, seem to have fallen under the dominion of Carthage, which gave her a footing on the island. The Greeks were still the more powerful party, and the Carthaginians occupied themselves in promoting dissensions among their cities. When the Greeks were occupied with the Persian invasion, they organized a great expedition to take possession of the island, in which they landed 300,000 men, contributed by all their dependencies. Among these Sardinians, Corsicans and Ligurians, the latter from the gulfs of Lyons and Genoa, are enumerated. They were totally defeated by Gelon, tyrant of Syracuse, and their leader slain, in the battle of Himera, 480 B.C. The Balearic, and many smaller islands in the Mediterranean, had already been occupied by the Carthaginians. Spain had also been colonized by them with peaceable commercial settlements. No other great enterprise took place in the first period of her history.

The war with the Greeks in Sicily was renewed in 409. Hannibal, the son of Gisco, landed an army at Lilybæum, in the spring of that year, and reduced Selinus and Himera. In a subsequent expedition Agrigentum was subdued. A pestilence seconded the efforts of Dionysius and saved Syracuse, 396 B.C. A treaty put an end to the war in 392. The struggle between the Greeks and the Carthaginians continued with varying success throughout the remainder of this period. Its most remarkable event was the invasion of Africa by Agathocles, 310 B.C. Defeated in Sicily by the Carthaginians, to avert the total ruin of his affairs, he raised an army and passed over to Africa. The most extraordinary success awaited him, showing at once the weakness of the hold which Carthage had of her external possessions on the continent, and the danger she constantly encountered from factions and dissensions within the city itself. Agathocles was the precursor of Scipio. After the death of Agathocles the Carthaginians renewed their enterprise in Sicily, and had nearly completed its conquest when the Greeks called in the aid of Pyrrhus, who for a time arrested their progress, 277–75 B.C. Notwithstanding numerous and disastrous defeats in their contests with the Greeks, the Carthaginians seemed, after the departure of Pyrrhus, to have the conquest of Sicily at length within her power. A dissension with the Mamertines, their former allies, called in the Romans, and with their invasion, 264 B.C., the third period of Carthaginian history begins.

The First Punic War, in which Rome and Carthage contended for the dominion of Sicily, was prolonged for 23 years, 264 to 241 B.C., and ended, through the exhaustion of the resources of Carthage, in her expulsion from the island. The Second Punic War, conducted on the side of the Carthaginians by the genius of Hannibal, lasted 17 years, 218 to 201 B.C., and after just missing the overthrow of Rome, ended in the complete humiliation of Carthage. The policy of Rome, at the end of this war, in placing Carthage, disarmed, at the mercy of her African enemies, and raising her a powerful opponent in Masinissa, occasioned the Third Punic War, in which Rome was the aggressor. It lasted only three years, but served to throw a halo of glory round the fall of Carthage, in whose total ruin it ended. This war, begun 150 B.C., ended, in 146 B.C., in the destruction of the last vestige of its power.

The repeated and not always unsuccessful struggles of Carthage with her African neighbors, in the very midst of her schemes of foreign conquest, indicate the marvelous tension to which a power inherently so weak was wrought in those great enterprises which virtually grasped at the supremacy of the world. In this matter the experience of Carthage was not unparalleled by that of Rome; but the great difference between them was that the former was surrounded by alien tribes, the latter by races kindred in language and manners, with whom, after conquest, she could easily unite. The invasion and conquest of Spain, begun by Hamilcar and carried on by Hasdrubal and Hannibal, and which led to the Second Punic War, can only be mentioned in passing.

Carthage perished leaving no historians to tell her tale; hence many interesting circumstances in her history can never be known, and what is preserved has the color of partial and often hostile authority. Recent excavations show that the streets crossed each other regularly at right angles. The long streets ran parallel to the quays and were distant from each other about 150 feet. The inhabitants are said to have numbered about 700,000 in 149 B.C. No foreign traders were allowed at any of her western colonies, and only the port of Carthage was open to foreigners. Traders found elsewhere were drowned. The revenue to cover her great military and naval expenditures appears to have been derived from tribute imposed on the neighboring subject races, from mines in Spain and from import duties on her vast commerce. Her merchant ships reached to every coast and island of the Mediterranean, and even to Britain and the Baltic shore. Her caravans penetrated far into the Dark Continent to the gold districts of the Niger and up the Nile. Many citizens, however, were not engaged in commercial pursuits, but cultivated large estates by means of slaves. The constitution of Carthage has occupied much of the attention of scholars, but still remains in many points obscure. The name of king occurs in the Greek accounts of it, and the first Carthaginian general who is recorded to have invaded Sicily and Sardinia is called Malchus, the Phœnician for king, but the monarchical constitution, as commonly understood, never appears to have existed in it. The officers called kings by the Greeks were two in number; the heads of an oligarchical republic, commonly called suffetes, the original name being considered identical with the Hebrew *shofetim*, judges. These officers were always chosen from the principal families, and were elected annually. It is not known if they could be re-elected. There was a senate of 300, and the citizens were divided into classes similar to the Roman tribes, curiæ and gentes. There was a smaller body of 30 chosen from the Senate, sometimes another smaller council of 10. Various other officers are mentioned, but the particulars regarding them are often obscure, and sometimes contradictory.

After the destruction of Carthage, her territory became the Roman province of Africa. A curse was pronounced upon the site of the city, and any attempt to rebuild it prohibited. The attempt was, however, made 24 years after her fall, by Caius Gracchus, one of the leading men of Rome. The same plan was entertained by Julius Cæsar, and it was accomplished by Augustus. The new city became the seat of the proconsul of Old Africa in place of Utica, and continued to flourish till the Vandal invasion. It became distinguished in the annals of the Christian Church. Cyprian was its bishop, and Tertullian is supposed to have been a native of it. Genseric made it the capital of the Vandal kingdom in 439. Belisarius took it in 533, and named it Colonia Justiniana Carthago. It was taken and destroyed by the Arabs, under Hassan, in 647. A few miserable hamlets and ruins mark its site. In recent times many excavations have been made, uncovering parts of the ancient walls and remains of the harbors; the citadel, the forum and the amphitheatre have been almost completely excavated, and have yielded many small objects and inscriptions, principally those from tombs of Punic and Roman times.

The religion of the ancient Carthaginians was essentially that of their Phœnician ancestors. They worshipped Moloch or Baal, to whom they offered human sacrifices; Hercules, the patron deity of Tyre and her colonies; Astarte, and other deities, which were identified with the heavenly bodies, but propitiated by cruel or lascivious rites. Their religion was considerably modified by their intercourse with the Greeks. After their defeat by Gelon he made it a condition of peace with them that they should abandon human sacrifices. Some of their deities were identified with those of the Greeks, and they adopted others of that people, and no doubt received also some of their ideas regarding them. Consult Arnold's and Mommsen's histories of Rome; Smith, R. B., 'Carthage and the Carthaginians' (London 1877); Church, A., 'Carthage, or the Empire of Africa' (New York 1886); Davis, N., 'Carthage and Her Remains' (London 1861); Meltzer, 'Geschichte der Karthager' (Berlin 1913); Moore, 'Carthage of the Phœnicians in the Light of Modern Excavation' (London 1905); de Sainte-Marie, E. de, 'Mission à Carthage' (Paris 1884); id., 'Atlas archéologique de la Tunisie' (Paris 1893); Audollent, 'Carthage romaine' (Paris 1901); also 'Comptes Rendus de l'Académie des Inscriptions et Belles Lettres' (Vol. XXVIII, Paris 1901), and map issued in 1907 by the French Minister of Public Instruction.

CARTHAGE, Ill., city and county-seat of Hancock County, on the Chicago, Burlington and Quincy and the Wabash railroads, 32 miles south of Burlington, Iowa. It is noted as the place where Joseph Smith, the Mormon prophet, was imprisoned and killed in 1844. Carthage was settled in 1837 and received a city charter in 1883. It operates its own waterworks. Carthage (Lutheran) College was opened here in 1872. Pop. 2,373.

CARTHAGE, Mo., city and county-seat of Jasper County, in the southwestern part of the State, on Spring River, and on the Saint Louis & San F., Missouri Pac., Iron M., Carthage and Western and Southwest Missouri Electric railways, 150 miles south of Kansas City. It is the centre of a fertile farming and fruit-raising region, and in the vicinity are rich mines of zinc and lead and extensive quarries of marble and building stone. The city exports large shipments of stone, marble, grain, flour, strawberries and other fruits, poultry, live stock and hides. It has 10 large quarries, zinc and stone works, bed-spring, shoe, overall, broom and cigar factories, flour mills and machine shops. There are five banks with $450,000 capital and an annual business of $2,000,000; and daily and weekly newspapers. Carthage has a county courthouse (cost $100,000), government post-office building (cost $90,000), a public library, high school building (cost $110,000), good public schools, a business college and a piano school. The following churches are represented: Presbyterian, Congregationalist, Baptist, Methodist (North and South), Episcopal, Christian, Roman Catholic, Christian Scientist, Dunkard and Adventist. The site of the city was first settled in 1833 by Henry Piercy. On 28 March 1842 it was made the county-seat and named Carthage. The town was practically destroyed in the Civil War (see CARTHAGE, BATTLE OF) and has been almost entirely rebuilt since 1866. The government is vested in a mayor and 10 councilmen elected for a term of two years. Pop. (1910) 9,483.

CARTHAGE, N. Y., village of Jefferson County, at the terminus of the Black River Canal and on the New York Central Railroad 18 miles east of Watertown. With West Carthage, joined by a bridge across the Black River, it forms a busy manufacturing centre with paper mills, machine shops, foundries, ice plants, house woodwork and furniture factories, brick works, etc. The village operates its own waterworks and maintains a public library. Pop. of West Carthage, a separately incorporated village, 1,393; of Carthage 3,563.

CARTHAGE, Battle of. On 17 June 1861, Gen. Nathaniel Lyon, U. S. A., drove the Confederates from Boonville, Mo., and Claiborne F. Jackson, the disloyal governor of Missouri, ordered a concentration of the State troops, who adhered to him, in the southwestern part of the State, to unite with the Arkansas troops, under the command of Gen. Ben. McCulloch. Anticipating McCulloch's movement into Missouri, Lyon ordered Gen. T. W. Sweeny, with three Union regiments, a small detachment of regulars and some artillery, from Saint Louis to Springfield. These were pushed forward by rail to Rolla and thence by road, and 28 June Col. Franz Sigel, with the 3d Missouri, arrived at Sarcoxie, southwest of Springfield, and 15 miles southeast of Carthage, Jasper County. Here Sigel learned that Gen. Sterling Price, with about 800 Missourians, was near Neosho, 22 miles south, and that Jackson, with other State troops, was to the north, 15 or 20 miles beyond Lamar, marching south. He concluded to move first on Price to disperse him, and then turn north on Jackson, his object being to prevent a junction of the two forces, and to open communication with Lyon, who was marching south from Boonville; but when he started after Price, on the morning of the 29th, he heard that he had retreated to join McCulloch, upon which he turned his thoughts toward Jackson, but continued his march to Neosho, where he was joined a few days later by Colonel Salomon, with the 5th (Union) Missouri. Captain Conrad's company of the 3d was left to hold Neosho, and on the 4th of July Sigel, with the two regiments and two batteries of four guns each, marched to Spring River, a short distance southeast of Carthage, where he heard that Jackson, with over 4,000 men, was but nine miles in his front in the direction of Lamar. On the morning of the 5th, with about 1,000 men and eight guns, he advanced slowly, his train three miles in the rear, driving back the enemy's mounted skirmishers, and about nine miles beyond Carthage came upon Jackson's troops in line of battle on elevated ground, four divisions under command of Gens. James S. Raines, John B. Clark, M. M. Parsons and W. Y. Slack, numbering nearly 5,000 men, 1,200 of whom were unarmed. About 1,800 were mounted men, armed with shotguns, and judiciously posted on the flanks of the infantry. Jackson had eight guns. After some skirmishing Sigel, at 10 o'clock, brought up seven guns and opened fire, which was promptly returned, but not effectively, for, being in want of proper ammunition, the Confederate guns were charged with pieces of chain, iron spikes, broken iron and round stones or pebbles. After a desultory artillery fire of three hours the Confederate horsemen advanced from both flanks and making a wide circuit, to avoid Sigel's artillery, began to close in on him and threaten his train, whereupon, disposing four guns in rear and two on either flank he fell back, harassed at every step, until he reached Carthage, where he made a stand. But, as the enemy was still pressing hard on him, working on both flanks and threatening the road to Springfield, he again fell back, skirmishing all the way, some two or three miles beyond Carthage, where pursuit ended, and Sigel marched to Sarcoxie, and thence by way of Mount Vernon to Springfield, where Lyon joined him on the 13th. The Union loss was 13 killed and 31 wounded, to which must be added the loss of Conrad's company of 94 men surprised and captured at Neosho, on the 5th, by Churchill's Arkansas regiment of McCulloch's command. The Confederate loss was about 30 killed and 125 wounded. The day after the engagement Jackson marched from Carthage and met McCulloch and Price coming to join him. Consult Official Records, Vol. III; Century, 'Battles and Leaders of the Civil War' (Vol. I).

E. A. Carman.

CARTHAGE, New. See Cartagena.

CARTHAGENA. See Cartagena.

CARTHUSIANS, an order of monks in the Roman Catholic Church founded in 1084 by Saint Bruno (q.v.), a priest of the diocese of Rheims and principal of the theological school there. Displeased with the impiety of his bishop, Bruno and several friends sought solitude in the diocese of Grenoble, and settled in a bleak and rocky wilderness near that city, called Cartusium (La Grand Chartreuse). The rule was at first not written, the followers imitating Bruno. The order was very rigid, prescribing perpetual silence, abstinence from flesh, habitual wearing of the cilicum or horsehair shirt, the eating of meals only once a day, excepting festival days. A Carthusian monastery covered a great deal of ground. It consisted usually of the great cloister around which were separate houses or «cells» of the monks; the lesser cloister with cells of various officials; worships of lay brothers, chapter-house, refectory, etc. The time of the monks was spent in oral and silent prayer, in manual labor and in study and a little recreation. The organization was democratic. The prior, who was elected by the professed monks of the community, was the general of the order. The visitors and priors formed the governing body, and all of these might be removed or reinstated at will. The officials assisting the prior were the vicar, or vice-prior, the procurator, the temporal administrator, the coadjutor, or host, the antiquior, who takes the vicar's place, the sacristan and the novice master.

A written rule was given to the Carthusians in 1129, by Guigo, the fifth prior. It comprised the hitherto unwritten laws of Saint Bruno, and additional rules for the government of the then much larger establishment. The order grew slowly. In 1300 there were but 39 monasteries. The order extended to Spain, England and even to Mexico. The original house, La Grande Chartreuse, existed, the troublous times of the Revolution excepted, down to 1903, when it was suppressed. In 1907, there were seven monasteries in Italy; four in Spain; the largest of all at Parkminster, Sussex, England; one in Germany, Switzerland and Austria. Some of the distinguished Carthusians were Saint Hugh, Saint Stephen, Saint Arthold and the famous copyists and authors, Ludolf of Saxony, Tromby, Sirius, Denis the Carthusian and Henry of Kalkar.

An order of Carthusian nuns was formed in the priorship of Saint Anthelm, about 1245. The arrangement of their day, with a few exceptions, is the same as that of the monks. Among the famous nuns have been Roseline of Villeneuve and Blessed Beatrix of Ornacieux. (See Chartreuse). Consult Heimbucher, 'Orden und Kongregationen der katholischen Kirche' (Paderborn 1907); 'La Grande Chartreuse par un Chartreux' (Lyons 1898); Le Couteulx, 'Annales Ordinis Cartusiensis' (8 vols., Montreuil 1901). The best description of Carthusian life is Thorold, 'Six Months at the Grande Chartreuse' (in the Dublin *Review*, April 1892).

CARTIER, kär-tyā, Sir George Etienne, Canadian statesman: b. Saint Antoine, Verchères County, Quebec, 6 Sept. 1814; d. London, 21 May 1873. He claimed descent from the family to which Jacques Cartier belonged: was among the followers of Papineau in the rebellion of 1837, distinguishing himself for his courage, but ultimately was obliged to take refuge in the United States. Returning when amnesty was decreed, he resumed the practice of law and attained to some eminence in his profession. He entered the Canadian Parliament as a Conservative in 1848, became a Cabinet Minister in 1855, and from that time till his death was closely associated with the English-speaking Conservative leader, Sir John A. Macdonald (q.v.). Cartier was Prime Minister 1858–62. When Canadian Federation was set on foot he took a prominent part in the negotiations, and it was under his leadership, aided by the Church, that French-speaking Canada was reconciled to the Federal system. He carried on the negotiations with the Hudson Bay Company which resulted in the surrender to Canada of the company's rights in the Northwest, and it was he who carried through the Canadian

Parliament the bill creating the province of Manitoba. This bill embodied elaborate safeguards for Roman Catholic separate schools, but its provisions were swept away in the well-known later agitation for a uniform school system in Manitoba. Perhaps Cartier's principal domestic achievement was the enactment in 1864 of the Civil Code for what is now the province of Quebec. In 1868 he was created a baronet to reward his services in establishing the new Dominion. He carried through the Canadian House of Commons in 1872 the first charter of the Canadian Pacific Railway. When Sir John Macdonald's government fell in 1873, Cartier was involved in the discredit to his chief, springing from what is known in Canadian history as the Pacific Scandal. Sir John Macdonald relied greatly upon Cartier's influence with the French Canadians, which, however, had declined before his death. See De Celles' 'Cartier' in the 'Makers of Canada' series.

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CARTIER, Jacques, French navigator: b. Saint Malo, 31 Dec. 1491; d. 1 Sept. 1557. After gaining some experience in fishing-fleets off the Labrador coast, he commanded an expedition to North America in 1534, entering the Strait of Belle Isle and sailed down the whole west coast of Newfoundland. He discovered Magdalen and Prince Edward Islands which he took for the main shore. He decided to wait before exploring further, and returned to Saint Malo. In 1536, he set sail again and, passing through the Strait of Belle Isle, anchored on the 9th of August in Pillage Bay. He named this the Saint Lawrence, and the name was gradually given to the entire river. In the same year he took possession of the mainland of Canada in the name of Francis I. The next year he sailed up the Saint Lawrence as far as the present Montreal. In 1541 he went out as captain-general in command of a first detachment of ships to prepare the way for Roberval, who had been named viceroy. Finding, however, that his chief did not arrive, after he had waited some time, he returned to Saint Malo. The natives usually received him well, but when about to return from his second voyage he treacherously kidnapped Donnaconna, one of the chiefs, and some others, in order to show them in his native country. In 1544 he set out to bring Roberval back. From this time until his death he gave technical advice in nautical matters and acted as Portuguese interpreter. His book, 'Discours du voyage fait par le capitaine Jacques Cartier aux terres neufves de Canada,' was published in 1598. A critical edition has been published by the University of Toronto and the best English version is that by James Phinney Baxter, published at Portland, Me., 1906.

CARTILAGE, one of the primary tissues of animal structures, of the connective-tissue class (q.v.), characterized by its peculiar basement substance. The most abundant form of cartilage is the hyaline variety, but there are also fibrous and fibro-elastic cartilages. Hyaline cartilage, particularly abundant on the ends of the bones, is whitish and translucent, firm and elastic. The cells are imbedded in an abundant homogeneous basement substance which is made up largely of chondrin. Fibrous cartilage is less abundant, and its basement substance is fibrillated. It is found about the intervertebral cartilage masses, about the joints and around the tendons of some of the larger muscles. The fibro-elastic form is found only in certain structures,—the epiglottis, the larynx, the Eustachian tube and in the external ear. Cartilage tissues protect the ends of the long bones by reason of their firm elasticity. They provide strong, firm and yet moveable structures, where bone, by reason of its rigidity, would not be serviceable, as in the epiglottis, larynx, etc. See Joints.

CARTON, Richard Claude, English actor and playwright: b. 1856. His real name is R. D. Critchett, and he early appeared in plays in Bristol and London. After being known as a collaborator with Cecil Raleigh on 'The Great Pink Pearl' (1885); 'The Pointsman' (1887); and 'The Treasure' (1888), he produced two original sentimental plays, 'Sunlight and Shadow' (1890); and 'Liberty Hall' (1892; revived New York 1913). Among his light comedies are 'The Home Secretary' (1895); 'The Tree of Knowledge' (1897); 'Lord and Lady Algy' (1898); 'The Ninth Waltz' (1900); 'A Clean Slate' (1902); 'The Rich Mrs. Repton' (1904); 'Lorrimer Sabiston, Dramatist' (1909); 'The Bear Leaders' (1911); 'A Busy Day' (1912).

CARTON, Sydney, the hero in Dickens' 'Tale of Two Cities.'

CARTOON (It. *cartone,* from Lat. *charta,* paper) a term having various significations. In painting, it denotes a sketch on thick paper, pasteboard or other material, used as a model for a large picture, especially in fresco, oil, tapestry and sometimes in glass and mosaic. In fresco painting, cartoons are particularly useful, because in this a quick process is necessary, and a fault cannot easily be corrected. In applying cartoons, the artist commonly traces them through, covering the back of the design with black-lead or red chalk; then, laying the picture on the wall or other matter, he passes lightly over each stroke of the design with a point, which leaves an impression of the color on the plate or wall; or the outlines of the figures are pricked with a needle, and then, the cartoon being placed against the wall, a bag of coal-dust is drawn over the holes, in order to transfer the outlines to the wall. In fresco painting, the figures were formerly cut out and fixed firmly on the moist plaster. The painter then traced their contour with a pencil of wood or iron, so that the outlines of the figures appeared on the fresh plaster, with a slight but distinct impression, when the cartoon was taken away. In the manufacture of a certain kind of tapestry the figures are still cut out, and laid behind or under the woof, by which the artist directs his operations. In this case the cartoons must be colored. In very modern times the term is commonly applied to pictures caricaturing notable characters or events of the moment. See Caricature and Caricaturists.

Among the most famous cartoons in existence are those executed by Raphael for the celebrated tapestries of the Vatican, which were made at Arras, and hence called Arazzi. Two sets of these tapestries were ordered by Leo X, one for the Vatican and the other for presentation to King Henry VIII. The second set, or fragments of it, are still in existence on the Continent. The cartoons lay for a time neglected at Arras, and have repeatedly fallen into neglect again, so that out of 25, the original number, only seven remain, and these have had to be restored. They were purchased at the advice of Rubens by Charles I about 1630. On the sale of his effects they were purchased by the order of Cromwell for the nation, but again fell into neglect in the time of Charles II. William III had them restored, and built a gallery for them at Hampton Court, where they remained, until in 1865 they were lent to the South Kensington Museum. The subjects of the seven are: (1) Paul Preaching at Athens; (2) The Death of Ananias; (3) Elymas the Sorcerer Struck with Blindness; (4) Christ's Charge to Peter; (5) The Sacrifice at Lystra; (6) Peter and John Healing the Cripple at the Beautiful Gate of the Temple; (7) The Miraculous Draught of Fishes. The cartoons have been repeatedly engraved, among others by Dorigny, Holloway and Gribelin. They have also been extensively made known by photographs. Other celebrated surviving examples are Mantegna's nine cartoons of the 'Triumph of Julius Cæsar,' now preserved at Hampton Court.

The cartoon of the School of Athens, carried to Paris by the French, and a fragment of the battle of Maxentius and Constantine, are preserved in the Ambrosian Gallery at Milan. There are, likewise, cartoons by Giulio Romano in the Sala Borgia, by Domenichino and other Italian masters, who caused their pictures to be executed, in a great degree, by their scholars, after these cartoons. The value set upon cartoons by the old Italian masters may be seen by Giovanni Armenini's 'Precetti della Pittura' (1687). In later times large paintings, particularly in fresco, were not executed so frequently. The artists also labored with less care, and formed their great works more from small sketches. In modern times some German artists have prepared accurate cartoons. Among them is Cornelius, whose cartoons for his fresco paintings in Munich have acquired much celebrity. He prepared, too, a cartoon for the fresco picture representing 'Joseph Interpreting the Dream.' Overbeck and Julius Schnorr may also be mentioned for their cartoons.

CARTOUCHE, kăr-toosh, **Louis Dominique**, French robber: b. Paris about 1693; d. Châtelet, France, 28 Nov. 1721. He was the leader of a noted company of robbers, and being captured was broken alive on the wheel in 1721. His life has formed the subject of a modern French drama, and was formerly represented on the English stage. Consult Maurice, 'Cartouche, histoire authentique' (Paris 1859).

CARTOUCHE, or **CARTOUCH** (French *cartouche*). (1) A wooden case about three inches thick at bottom, and girt round with marline, holding 200, 300 or 400 musket-balls, with 8 or 10 iron balls weighing one pound each, to be fired from a mortar, gun or howitzer for the defense of a pass, retrenchment, etc. Such missiles have been superseded. In French military language cartouche signifies the entire charge of a firearm. (2) In architecture, sculpture, etc., an ornament representing a scroll of paper, being usually in the form of a table, or flat member, with wavings, whereon is some inscription or device. (3) The name given by the French literati to that oval ring or border which includes, in the Egyptian hieroglyphics, the names of persons of high distinction. (4) In heraldry a name given to a sort of oval shield, much used by the Popes and secular princes in Italy, and others, both clergy and laity, for painting or engraving their arms on.

CARTRIDGE, a case of paper, parchment, metal or flannel suited to the bore of firearms, and holding the exact charge, including, in the case of small arms, both powder and bullet (or shot). In loading with the old style of cartridge for muzzle-loading rifles before the Civil War, the paper over the powder was bitten or twisted off and the powder poured in, the bullet being then inserted and rammed home. In the first breech-loaders similar cartridges were used but trouble developed through the escape of gas from the breech to the mechanism and the metallic cartridge was developed to obviate this difficulty. At first copper was used, with the priming in the rim, but the danger of accidental discharge being very great the primer was placed opposite the centre of the head in a small cap outside the case, for which brass was now used. The cartridges used for breech-loading rifles contain the powder in a case of solid brass, and have the percussion-cap by which they are ignited fixed in the base. Such cases can be refilled and used a number of times in succession. Cartridges for shot-guns are similar to those for rifles, but are usually of less solid construction, being commonly of strong paper with a base of metal. Those for large guns are usually made of flannel and contain only the powder, the projectile being loaded separately. Machine guns became possible after the advent of metallic small-arms ammunition, and in turn developed it. This kind of gun increased in calibre and fixed ammunition continued to be used and many difficulties in manufacture were overcome. Cartridge cases now are generally drawn from one piece in dies, whether they are small or large cases. Blank-cartridge is a cartridge without ball or shot. It is used for practice, salutes or signals. A dummy cartridge has no powder, and is used for drill purposes only. Cartridges for blasting are filled with dynamite or other explosive. See AMMUNITION.

CARTRIDGE-PAPER, a thick paper originally made for the manufacture of cartridges, but extensively used in the arts, its rough surface giving it an advantage for drawing upon, as a wall paper and for other purposes.

CARTWRIGHT, Edmund, English clergyman and inventor: b. Marnham, Nottinghamshire, 24 April 1743; d. Hastings, Sussex, 30 Oct. 1823. He was educated at University College, Oxford, and having taken orders in the Church, obtained first the living of Brampton, near Chesterfield, and afterward that of Goadby-Marwood, in Leicestershire. It was, however, only after he had reached 40 years of age that his attention was first turned to the subject on which his claim to remembrance is founded. In the summer of 1784 he began to investigate the subject of mechanical weaving, and experiment regarding improvements. His efforts were crowned with success, and in April of the following year he brought his first power-loom into action. It was not, in fact, in respect of economy of labor, any advance upon the ordinary hand-loom; but the idea which subsequent improvements have carried so far in advance of hand-loom weaving was there. The introduction of Cartwright's loom was opposed both by manufacturers and workmen; and the first mill erected for them, containing 500 looms, was burned down. His attention once turned in the direction of mechanical improvement, he continued to make progress in discovery. He not only perfected his power-loom, but took out 10 patents for different inventions, among which was one for combing wool. He also assisted Robert Fulton in his steamboat experiments. He expended much of his means in these investigations, and in 1809 he received as an acknowledgment of their value a grant from Parliament of £10,000, which relieved him from straitened circumstances, although, it is said, it did not cover his expenditure. He also received premiums for various improvements from the Society of Arts and the Board of Agriculture. His life was published by his daughter (London 1843).

CARTWRIGHT, John, English reformer, brother of Edmund Cartwright (q.v.): b. Marnham, Nottinghamshire, 17 Sept. 1740; d. London, 23 Sept. 1824. He entered the navy in 1758, and became a first lieutenant in 1766. In 1774 his attention was turned to politics. In his ‹Letters on American Independence› (Independence of America considered as supremely useful and glorious to Great Britain), written in this year, he advocated a union between the colonies and the mother state, under separate legislatures, and argued this great question on the foundation of natural, inherent right; maintaining «that the liberty of man is not derived from charters, but from God, and that it is original in every one.» In 1775 he was appointed major of the Nottinghamshire militia, and after several ineffectual attempts on the part of government to remove him from that post, his dismissal was finally accomplished in 1792, in consequence of an act of Parliament. In the American war Lord Howe was desirous of having him with him in America; but Major Cartwright, although always eager for promotion in the navy, refused the proposal, alleging that he could not fight in a cause which he disapproved. From this time he devoted himself to the favorite objects of annual parliaments and universal suffrage. He was the author of a Declaration of Rights, distributed by the Society for Constitutional Information. The French Revolution was warmly welcomed by Cartwright. In the trials of Tooke, Hardy, Thelwall and other reformers, Cartwright was present as a witness, and displayed much firmness and fearlessness. By his writings, public addresses, etc., he continued to promote the work of reform and constitutional liberty; and as late as 1820 was tried for conspiracy and sedition, for advising the inhabitants of Birmingham, which had then no parliamentary representative, to send what he called their «legislatorial attorney» to the house; but he escaped with a fine of £100. Major Cartwright was not a political reformer only. The plan of making the slave-trade piracy is said to have been first developed in his ‹Letters on the Slave-Trade.› A statue has been erected in London to his memory. A list of his writings has been edited by his niece, F. D. Cartwright, ‹The Life and Correspondence of Major Cartwright› (2 vols., London 1826).

CARTWRIGHT, Peter, American Methodist clergyman: b. Virginia, 1 Sept. 1785; d. near Pleasant Plains, Ill., 25 Sept. 1872. He was ordained in Kentucky in 1806, and in 1823 removed to Illinois, where he labored for nearly half a century. He also sat in the State legislature there, and in 1846 was defeated by Abraham Lincoln in an election for congressman. Admired for his eloquence and strong common sense, he was also loved for his quaint eccentricity of manner, and possessed great influence in his own denomination. He published many pamphlets, among which the best known is ‹Controversy with the Devil› (1853). Many of the stories of his adventures with the backwoodsmen are found in ‹Fifty Years a Presiding Elder,› and ‹Autobiography of Peter Cartwright› (New York 1856). Consult Stevens, ‹Observations on Dr. Cartwright and the Backwoods Preacher› (London 1869).

CARTWRIGHT, Sir Richard John, Canadian statesman: b. Kingston, Ontario, 4 Dec. 1835; d. 24 Sept. 1912. He was educated at Trinity College, Dublin, and entered the Canadian Parliament in 1863 as a Conservative, but on account of a disagreement with Sir John A. Macdonald joined the Liberal party. He was Minister of Finance from 1873 until 1878; and Minister of Trade and Commerce, 1896–1911. He was a member of the Joint High Commission of 1897 appointed to settle outstanding questions with the United States, and was in favor of the establishment of freer trade relations with that country. He was created G.C.M.G. in 1879.

CARTWRIGHT, Thomas, English Puritan divine: b. Hertfordshire 1535; d. Warwick, 27 Dec. 1603. He studied theology at Cambridge and was elected to a scholarship at Saint John's College there in 1550. He was active in defending the new religious opinions then current at Cambridge. He withdrew in Mary's reign from the university and was a law clerk for a time. He suffered imprisonment and exile more than once for his nonconformist opinions. He was a learned man, and at one time professor of divinity at Cambridge. He made a visit to Geneva, where he met Theodore Beza. In 1572 he returned to England just at a time when intense excitement was being caused by the publication of ‹Admonition to the Parliament,› written by Field and Wilcox. Cartwright espoused the cause of the authors, who were imprisoned, and defended the book in a second ‹Admonition to the Parliament.› This was answered by Whitgift and was followed by another paper from Cartwright. The controversy led Hooker to publish his ‹Ecclesiastical Polity.› In 1573 Cartwright, learning of a warrant being issued for his arrest, fled to the Continent. His chief books are ‹A Confutation of the Rhenish Translation›; ‹Harmonia Evangelica›; and a criticism of Hooker's ‹Ecclesiastical Polity.› Consult Dexter, ‹Congregationalism› (New York 1880); Mullinger, ‹Thomas Cartwright› (In Dict. Nat. Biog., Vol. IX).

CARUCATE, kăr'ū-kāt, in mediæval times, as much land as one team could plow in the year. The size varied according to the nature of the soil and practice of husbandry in different districts.

CARUPANO, kä-roo'pä-nō, Venezuela, seaport of the state of Bermudez, on the north coast of the peninsula of Paria, with a lighthouse and good roadstead. The surrounding district is fertile, and has mines of copper, sulphur, silver, lead and lignite. The city exports cotton, dyewoods, cocoa, coffee, fish, etc., and manufactures hats, ropes, soap, brandy, sugar and earthenware. Pop. about 9,000.

CARUS, kä-rŭs, **Julius Victor**, German zoologist: b. Leipzig, 25 Aug. 1823; d. 1903. After studying at Leipzig, Würzburg and Freiburg, he became at the age of 26 keeper of the Oxford museum of comparative anatomy. In 1853, two years after his return to his native city, he was appointed professor of comparative anatomy and director of the Zoological Institute there where subsequently he was made professor extraordinarius of zoology. Among his numerous writings are ‘System der tierischen Morphologie’ (1853); ‘Handbuch der Zoologie’; and ‘Geschichte der Zoologie.’ He has translated most of Darwin's works into German and in 1878 became editor of the *Zoologischer Anzeiger*.

CARUS, Karl Gustav, German physician and physiologist: b. Leipzig, 3 Jan. 1789; d. Dresden, 28 July 1869. He became professor of obstetrics at the Medical Academy of Dresden, and then royal physician, being subsequently a privy councillor. He published a great number of writings covering a wide field of science, including medicine, physiology, anatomy, psychology, physics, painting, besides memoirs of his life. Among these are ‘System der Physiologie’ (1838–40); ‘Lebenserinnerungen und Denkwürdigkeiten’ (1865–66); ‘Lehrbuch der Zootomie’ (1818); ‘Über den Blutkreislauf der Insekten’ (1827); ‘Psyche’ (1851).

CARUS, Marcus Aurelius, Roman Emperor: b. Nerona, Dalmatia, about 222 A.D.; d. near Ctesiphon, Mesopotamia, 283. His father was an African and his mother a noble Roman lady. He was proclaimed emperor by the legions, on the assassination of Probus, 282. He caused justice to be executed upon the assassin. He gained a signal victory over the Sarmatians, and prosecuted the war against the Persians. Undertaking the campaign in midwinter, and making a rapid march through Thrace and Asia Minor, he ravaged Mesopotamia, made himself master of Seleucia and carried his arms beyond the Tigris.

CARUS, Paul, American philosophical writer: b. Ilsenburg, Germany, 18 July 1852. He was educated in the universities of Strassburg and Tübingen, and has been a resident of Chicago for several years, where he is editor of *The Open Court* and *The Monist*. Under his direction the Open Court Publishing Company has done fine service in putting before the public valuable works on philosophy and religion. He has published ‘The Ethical Problem’; ‘Fundamental Problems’; ‘The Soul of Man’ (1891); ‘Primer of Philosophy’; ‘Truth in Fiction’; ‘Monism and Meliorism’ (1891); ‘The Religion of Science’ (1893); ‘The Philosophy of the Tool’; ‘Our Need of Philosophy’; ‘Science: a Religious Revelation’; ‘The Gospel of Buddha’; ‘Kanna’; ‘Nirvana’; ‘Homilies of Science’; ‘Chinese Philosophy’; ‘The Idea of a God’; ‘Buddhism and Its Christian Critics’; ‘The Dawn of a New Era’; ‘Kant and Spencer’; ‘The Nature of the State’; ‘The History of the Devil’ (1900); ‘Whence and Whither?’; ‘Eros and Psyche’; ‘God: an Inquiry into Man's Highest Ideals’ (1908); ‘The Mechanistic Theory, and the non-Mechanical’ (1913); ‘The Principle of Relativity’ (1913); ‘Truth on Trial: a critique on Pragmatism’; ‘Philosophy as a Science’; ‘Goethe: the man and his work’; ‘Nietzsche; and other Exponents of Individualism’ (1914); ‘Venus and Woman as the Cosmic Principle.’

CARUSO, Enrico, Italian operatic tenor: b. Naples, 25 Feb. 1873. At the age of 11 he began to sing in the churches of his native city. He studied under Guglielmo Vergine for three years, and was also a pupil of Lamperti and Concone. He made his début in ‘L'Amico Francesco,’ at the Nuovo Teatro, Naples, in 1894; and later toured Italy and Sicily and was engaged for four seasons at La Scala, Milan. He attracted general attention in 1896 in ‘Traviata’ at the Teatro del Fondo, Naples. Engagements followed at Petrograd, Moscow, Warsaw, Rome, Paris, Lisbon and Buenos Aires. He was everywhere hailed as one of the most promising young tenors Italy had produced. He came to the United States in 1903 and was received with great acclaim. His repertoire includes more than 40 operas (chiefly Italian). He created rôles in Giordano's ‘Fedora’; Mascagni's ‘Le Maschere’; Franchetti's ‘Germania’; Puccini's ‘Bohème’; ‘Madame Butterfly’ and ‘The Girl of the Golden West.’ Since his first appearance in 1903 he has become the chief attraction of the Metropolitan Opera House Company in New York, his voice being one of extraordinary beauty and power, though lacking the highest artistic refinement and expression, while his acting does not rise above the conventional. Consult Wagenmann, J. H., ‘Enrico Caruso und das Problem der Stimmbildung’ (Altenburg 1911).

CARUTTI DI CANTOGNO, kä-rūt'tē dē kân-tōn'yō, **Domenico**, BARON, Italian historian and publicist: b. Cumiana, 26 Nov. 1821; d. Turin, 1909. As a young man he took to romance writing, but was speedily absorbed in politics and rose to great distinction. When he resumed the pen, it was to compile such solid works as ‘History of the Reign of Victor Amadeus II’ (1856) and ‘History of the Reign of Charles Emmanuel III’ (1859), which are interesting and scholarly. In 1884 he became president of the Royal Commission on the Study of National History at Turin and in 1889 was made senator of the kingdom. Other works, in addition to those mentioned above, are ‘History of the Diplomacy of the House of Savoy’ (Turin 1876); ‘Count Umberto I’ (Florence 1878); ‘Poems’ (Rome 1872) and an essay on Propertius.

CARVAJAL, kär-vä-häl', **Gaspar de**, Spanish missionary: b. Spain, early in the 16th century; d. Lima, Peru, 1584. He entered the Dominican order and went to Peru in 1533.

In 1538 he accompanied the expedition of Gonzalo Pizarro to the countries east of the Quito as chaplain. He was appointed sub-prior of the convent of San Rosario at Lima; after the pacification of Peru he was sent to the mission of Tucuman and after working among the Indians there was made vicar-national of the province of Tucuman. With the aid of the Dominicans, whom he brought into the country, he established several Indian towns and Spanish colonies. He wrote 'Descubrimiento del Río de las Amazonas' unedited until 1894.

CARVAJAL, Tomas José Gonzales, Spanish statesman and author: b. Seville, 21 Dec. 1753; d. 9 Nov. 1834. He was educated in Seville, where he studied theology and jurisprudence, becoming also famed as a Latinist. He was appointed in 1795 governor of the new colonies in Sierra Morena and Andalusia, and protested against the French invasion of Spain in 1808. From 1809 to 1811 he served as commissary in the Spanish army against Bonaparte; in 1813 became Minister of Finance; relinquished these offices to assume the directorship of the Royal University of Isidro, where he became involved in difficulties by establishing a professorship of constitutional law. He was arrested and detained in prison from 1815 to 1820, when the revolution reinstated him at San Isidro. A counter revolution brought his opponents into power, and he was exiled from 1823 to 1827. However, at the time of his death he was member of the supreme council of war, of the military department of the Spanish and Indian boards and a grandee of Spain. He learned Hebrew at the age of 57 in order to translate the Psalms. This translation has gained for him a high reputation for poetical power. He also wrote metrical translations of the other poetical books of the Bible and other works in prose and verse, of which the high quality brought him membership in the Real Academia Española and in the Real Academia de la Historia. The Spanish Academy included his name in the 'Catálogo de autoridades de la lengua castellana.'

CARVALHO, kär-väl'yō, **José da Silva,** Portuguese statesman: b. Beira 1782; d. 3 Feb. 1845. He studied law at the University of Coimbra, and became a judge in 1810. His prominent part in the revolution of 1820 caused him to become a member of the provisional government. He was a member of the regency and appointed Minister of Justice until 1823, when, on the downfall of the constitutional government, of which he was a foremost champion, he was obliged to resort to flight to England, where he remained until 1826, when he returned to Lisbon, but Dom Miguel's success again compelled him to leave. Eventually he was named a member of the council of guardianship instituted by Dom Pedro for the young Queen, Donna Maria, and succeeded in negotiating the first English loan for Portugal. Having accompanied Dom Pedro to the Azores, he filled, on his return to Portugal, important offices, and became Finance Minister in 1832. In 1835 he retired with the Palmella administration, and was presently obliged to leave for England, where he remained until 1838, when a general amnesty was proclaimed. He returned in 1842. When the constitution of Dom Pedro was re-established, he became councillor of state.

CARVALHO, Paez de Andrade, Manoel de, Brazilian politician: b. about 1795; d. Rio de Janeiro, 18 June 1855. Elected temporary President of Pernambuco in December 1823, he led a revolt the next year against Pedro I, the Emperor, and on 2 July 1824 announced a republic entitled 'Confederaçao do Equador.' On the suppression of the revolt in October, Carvalho fled to England, but subsequently returned to Brazil and was a senator from 1835.

CARVELL, Frank Broadstreet, Canadian legislator: b. Bloomfield, County Carleton, New Brunswick, 14 Aug. 1862. He was graduated LL.B. at Boston University in 1890, and called to the bar of his native province in the same year. He represented Carleton in the provincial assembly as a Liberal, 1899–1900; resigned his seat in the latter year to contest (unsuccessfully) the same county for the Dominion House of Commons, but was elected in 1904 and has since retained the seat. He made his mark in the House in the debates on the administration of the Militia Department under the Borden government during the Great War, and his searching criticisms on the subject were followed by investigation by a commission appointed by Parliament but he supported (1917) the principle of compulsory military service with which that government identified itself, and on that question voted against his leader, Sir Wilfrid Laurier. In October 1917 he became Minister of Public Works in the Union government of Sir Robert Borden.

CARVER, John, first governor of the Plymouth colony: b. England, about 1575; d. Plymouth, Mass., April 1621. He joined the Leyden colony of English exiles about 1608, and as their agent assisted in securing a charter from the Virginia Company and in selecting and equipping the *Mayflower*. He was elected governor, probably 11 Nov. 1620, after the *Mayflower* reached Provincetown, showed great ability and judgment in governing the infant colony after the landing at Plymouth, and established by a treaty with the Indians peaceful relations that remained for many years undisturbed. He was re-elected in March 1621, but died a few days afterward. His chair and sword are still preserved as Pilgrim relics.

CARVER, Jonathan, American traveler: b. Stillwater, N. Y. (the universal ascription to Connecticut is an error), 1732; d. London 1780. He embraced a military career, and in the French War of 1756 commanded a company of provincials, in the expedition across the lakes against Canada. When peace was concluded in 1763, Carver undertook to explore the vast territory which Great Britain had gained. His object was to acquire a knowledge of the manners, customs, languages, soil and natural productions of the nations and region beyond the Mississippi, and to ascertain the breadth of the continent by penetrating to the Pacific over its widest part, between lat. 43° and 46° N. He accordingly set out from Boston in 1766, and having reached Michilimackinac, the remotest English post, applied to Mr. Rogers, the governor, for an assortment of goods as presents for the Indians dwelling in the parts through which his course was to be directed. Receiving a portion of the supply which he desired, and a promise that the residue should be sent to him at the falls of Saint Anthony, he continued his journey. But not obtaining the goods at the appointed place, in consequence of their having been disposed of elsewhere by those to whom the governor had entrusted them, he found it necessary to return to La Prairie du Chien. He then, in the beginning of the year 1767, directed his steps northward, with a view of finding a communication from the heads of the Mississippi into Lake Superior, in order to meet, at the grand portage on the northwest side of that lake, the traders that usually came about this season from Michilimackinac, from whom he intended to purchase goods, and then to pursue his journey. He reached Lake Superior in good time; but unfortunately the traders whom he met there could not furnish him with any goods, as they had barely enough for their own purposes, and, in consequence, he was obliged to return to the place whence he first departed, which he did in October 1768, after remaining some months on the north and east borders of Lake Superior, and exploring the bays and rivers that empty themselves into that body of water. He soon after repaired to England with the view of publishing his journal and charts, and of obtaining reimbursement for the expenses which he had incurred. Having undergone a long examination before the lords commissioners of trade and plantations, he received permission to publish his papers; but when they were nearly ready for the press an order was issued from the council-board, requiring him to deliver immediately into the plantation office all his charts and journals. He was, consequently, obliged to repurchase them at a great expense from the bookseller to whom he had disposed of them — a loss for which he received no indemnification, but was forced to be satisfied with that obtained for his other expenses. He had fortunately kept copies of his papers, and he published them 10 years afterward in Boston, while in the situation of a clerk of a lottery. His works are 'Travels Through the Interior Parts of North America' (1778); 'Treatise on the Culture of the Tobacco Plant' (1779); 'The New Universal Traveler'; 'Literary History of the American Revolution.' Consult 'The Carver Centenary' (1867 published by the Minnesota Historical Society); Bourne, E. G. (in the *American Historical Review,* January 1906).

CARVER, Thomas Nixon, American economist: b. Kirkville, Iowa, 25 March 1865. He studied at Iowa Wesleyan University, the University of Southern California, Johns Hopkins and Cornell; was professor of economics at Oberlin College from 1894 to 1900, when he became assistant professor of political economy at Harvard University and full professor in 1902. In 1913 he was given charge of the rural organization service of the Department of Agriculture to investigate the marketing and distribution of farm products. A frequent contributor to economic reviews, his published works include 'The Theory of Wages adjusted to Recent Theories of Value' (1894); 'The Distribution of Wealth' (1904); Sociology and Social Progress' (1905); 'Principles of Rural Economics' (1911); 'The Religion Worth Having' (1911–12).

CARVING, as a branch of sculpture, the art of cutting a hard material by means of a sharp instrument: but there are extended uses of the term, as shown below.

The term is generally employed for work which is strictly decorative as distinguished from grand sculpture; thus the wrought stone leafage, scroll work and even animal forms in a Gothic porch, are *carving* in common parlance, and so are the human figures of the porch if they are conventional or stiff, as often happens in mediæval work. In a Roman temple or a neo-classic edifice the leafage of Corinthian capitals or of any panel or string-course would be called *carving,* while the statues and even the reliefs of human subjects would be spoken of as sculpture (q.v.). Small pieces, even of human subjects, such as decorative statuettes and groups, are spoken of as carving, and these may be wrought in wood, ivory, bone, marble, and other stones, and even in hard and semi-precious stones, such as agate and jade. The carvings of the Chinese and Japanese are especially in demand in Western lands, because of their picturesque beauty. When they are of wood they are often painted, gilded or lacquered with a rich polychromatic effect.

Throughout the middle ages of Europe, ivory statuettes, backs of mirrors and purely ornamental objects were treated in the same way, the carving being helped out by color and gold with extraordinary results.

Carving, when done in very hard material, such as rock crystal and jade, requires much use of the drill, in which case the meaning of the term must be extended to include the result produced by a rapidly revolving pin with emery powder or the like. One of the most ingenious and useful purposes to which carving has been converted in more modern times is that of engraving wood-cuts or blocks for printing. (See WOOD-ENGRAVING). Carving has been applied to almost innumerable uses in manufactures as well as in art. Some of these applications have given way to the art of engraving in metal and other processes, but new ones are continually arising. The first carving-machine was invented about 1800, and many others have since been patented.

CARY, Alice, American poet: b. near Cincinnati, Ohio, 26 April 1820; d. New York, 12 Feb. 1871. When quite young she began writing sketches and poems for the press, and in 1852 she, with her sister, Phœbe (q.v.), removed to New York, where they lived during the rest of their lives. In 1850 the sisters published a volume entitled 'Poems by Alice and Phœbe Cary.' Alice soon after published 'Clovernook, or Recollections of Our Neighborhood in the West' (1851–53); 'Lyra, and Other Poems' (1853); 'Hagar, a Story of To-day' (1852); 'Married, not Mated,' a novel (1856); 'Lyrics and Hymns'; 'The Bishop's Son'; 'The Lover's Diary' (1867); and 'Snow Berries: A Book for Young Folks' (1869). The verse of the Cary sisters still retains a hold upon the affections of readers and not a few lines of theirs have become familiarized by frequent quotation. While living in New York they attracted about them a circle of literary people, and for 15 years their Sunday evening receptions were a feature in the literary life of the city. Consult Ames, Mary C., ‘Memorial of Alice and Phœbe Cary’ (New York 1873).

CARY, Annie Louise, American singer: b. Wayne, Me., 22 Oct. 1842. She studied in Milan, made her operatic début in Copenhagen in 1868, had a successful European career for three years, and returned in 1870 to the United States, where she won great popularity and remained, with the exception of one brilliant European tour, until 1882, when she married Charles M. Raymond, and retired from the stage while her voice was still unimpaired. Since then she has sung only in private or for charity. She created, in New York, the part of Amneris in ‘Aïda’ (1873).

CARY, Archibald, American statesman: b. Virginia, about 1730; d. Chesterfield, Va., September 1786. He early became a member of the House of Burgesses, and in 1764 served on the committee which reported the address to the King, Lords and Commons, on the principles of taxation; and in 1770 was one of the signers of the «Mercantile Association,» which pledged its members to use no British fabrics thereafter, the design being to resist by practical measures the encroachments of the government. In 1773 he was one of the celebrated committee of correspondence by which the colonies were united into one great league against Parliament. When the State government was organized he was returned to the senate, where he presided with great dignity and efficiency. At this time occurred the incident with which his name is most generally connected. The scheme of a dictatorship had been broached, and without his knowledge or consent Patrick Henry was spoken of for the post. In the midst of the general agitation Cary met Henry's half-brother in the lobby of the assembly, and said to him: «Sir, I am told that your brother wishes to be dictator. Tell him from me, that the day of his appointment shall be the day of his death, for he shall find my dagger in his heart before the sunset of that day.» The project was speedily abandoned. He was a good representative of the former race of Virginia planters, delighting in agricultural pursuits, in blooded horses and improved breeds of cattle, which he imported from England, and attended to with great care.

CARY, Henry Francis, English clergyman, translator of Dante: b. Gibraltar, Spain, 6 Dec. 1772; d. London, 14 Aug. 1844. In 1790 he entered Christ Church, Oxford, and he took orders in 1796. In 1796 he was presented to the vicarage of Abbot's Bromley, Staffordshire, and in 1800 he removed to Kingsbury, in Warwickshire, another living to which he had been presented. His studies while at college had embraced a wide range of Italian, French and English literature, and in 1805 he gave proof of his Italian scholarship, as well as of his poetic powers, by the publication of the ‘Inferno’ of Dante in English blank-verse, accompanied by the Italian text. The entire translation of the ‘Divina Commedia’ was accomplished in 1814, and the work was now published complete, but it lay unnoticed for several years, till Sanuel Taylor Coleridge drew attention to its merits. It has since been recognized as a standard English work. Cary subsequently translated the ‘Birds’ of Aristophanes (1824), and the ‘Odes’ of Pindar, and wrote a continuation of Johnson's ‘Lives of the English Poets,’ and a series of ‘Lives of Early French Poets.’ He was for some time curate of the Savoy, London, and in 1826 was appointed assistant keeper of printed books in the British Museum, which office he resigned in consequence of his being passed by on the appointment of Mr. Panizzi in 1837 to the office of keeper of the printed books. The government in 1841 granted him a pension of £200 a year as a recognition of his literary abilities, and he devoted himself henceforth to the annotation of a new edition of his translation of Dante, and to editions of the English poets, Pope, Cowper, Milton, Young, etc. He was buried in Westminster Abbey. His son, Henry Cary, has written a ‘Memoir’ (London 1847).

CARY, Lott, American negro slave: b. Virginia 1780; d. Africa 1828. He educated himself, became a Baptist minister, purchased the freedom of himself and his two children for $850, and joined the colony sent in 1822 to Liberia, where he performed inestimable services in behalf of the new republic. He was acting as vice-agent with full power when he was accidentally killed while making cartridges for defense against the slave traders.

CARY, Lucius. See Falkland.

CARY, Phœbe, American poet and prose-writer, sister of Alice Cary (q.v.): b. Cincinnati, Ohio, 4 Sept. 1824; d. Newport, R. I., 31 July 1871. She contributed numerous sketches to various periodicals; and with her sister published several books, among which are ‘Poems and Parodies’ (1854); and ‘Poems of Faith, Hope and Love.’ She will be longest remembered as the author of the popular hymn beginning, ‘One Sweetly Solemn Thought.’ Consult Trent, ‘A History of American Literature’ (New York 1903).

CARY REBELLION, in North Carolina, an outcome of the religious and political disturbances set going by the constitution of Locke and Shaftesbury, whose laws and discriminations survived itself. (See Carolina, Original Constitution of). One of these, requiring an oath to support the constitution and laws, debarred the Quakers (who were among the most influential of the early settlers, and by no means inclined to submit peaceably to oppression) from voting or holding office, or being witnesses in criminal suits. The establishment of and taxation for the Church of England was a common grievance to all the colony, nearly all its population being dissenters; and there were other obnoxious ordinances. At this time Albemarle County (North Carolina) had its separate deputy governor, appointed by the governor of the entire colony; and in 1704 Sir Nathaniel Johnson so appointed Robert Daniel, a churchman, and «landgrave» or hereditary noble and councillor. He tried to enforce the laws; and one John Porter, an influential Quaker, shortly went to England to complain of him and of vexatious legislation against his sect. One of the proprietors, John Archdale (q.v.), ex-governor, was himself a Quaker, and induced the other proprietors to remove Daniel; and Johnson appointed Thomas Cary, a Carolina merchant, said to have been Archdale's son-in-law, in his place. Cary, however, felt bound to enforce the laws, and again the Quakers complained. Cary was removed (the accepted account says he was in ill odor with the proprietors for having been short in his accounts as collector of revenue for them); and this time the appointment of a deputy for Albemarle was taken from the governor, and a new proprietary council formed, with Porter and several other Quakers on it. On Porter's return to America in 1707, he convened the council, which elected William Glover, a churchman, president. Glover insisted on enforcement of the laws as before, and Porter's party turned against him, declared his election illegal, struck a bargain with Cary and elected him president in Glover's place. Glover and his section refused to recognize the validity of the new election, and held their meetings in one room of the executive mansion, while Cary and his councillors met in the other. Daniel, as a landgrave, was ipso facto a councillor, and sat alternately in both. Each party issued writs for election to the assembly, and it seems to have held without formal recognition of either; but Cary's party held the majority. In 1710 Edward Hyde, a relative of Clarendon's, was appointed deputy governor by the proprietors, and came out in August 1710 to assume office. His commission was to be taken from Tynte, who had succeeded Johnson; but Tynte had died, and Hyde had only his letters from the proprietors to show. The Cary party, however, was glad to acknowledge him so long as it held the power and he confirmed it; but the next assembly was held by its enemies; Hyde apparently aided it in enforcing the laws in favor of the Church, and Cary's party promptly refused to acknowledge his authority and made open war on him. Cary attacked Edenton with two armed vessels, but was repulsed, and Hyde called on Governor Spotswood of Virginia for help. Spotswood admitted that the revolters were «dangerous incendiaries,» but said the country was almost inaccessible, and he had only militia; but finally sent some of his marines from the guard-ships at Hampton Roads. Cary, with his chief men, Levy, Truitt, etc., thereupon went to Virginia, apparently for temporary refuge, declaring that they would go to England and appeal to the proprietors. Spotswood took them at their word, and sent them, seemingly against their will, to England; and they disappear from history. That they were discharged, however, is apparent from a circular letter of Lord Dartmouth to the colonies, at this juncture, to send no more prisoners to England for trial without proof of their guilt. At home, the burgesses refused to provide for the defense of the colony unless they could have share in the government and what they held to be their rights; and the result was a fearful desolation in a war which soon broke out with the Tuscaroras.

CARYATIDES, or **CARYATIDS**, kar-ĭ-ăt'ĭ-dēz, in architecture, a name used to designate female figures made to support a roof, cornice, etc., instead of columns. The goddess Artemis (Diana), who had a temple in Caryæ, a Peloponnesian city, was for this reason called *Karyatis*. In honor of her, virgins danced in a festive procession during an annual feast, which suggested to architects the idea of adopting the images of virgins to serve as columns. Thus Lessing and others explain the name and form of the caryatides. Another explanation of their origin is the following: The inhabitants of Caryæ allied themselves with the Persians in their war with the Greeks. The Greeks, on the successful termination of that struggle, exterminated the males of Caryæ, and reduced all the women to slavery. As a mark of infamy, and to perpetuate the memory of the transaction, the architects of the time made statues representing these women in the servile office of supporting entablatures. The figures are distinguished by gracefulness and quiet dignity of pose. There are fine examples in the Erectheum at Athens and British Museum. Consult Homolle, in *Bulletin de Correspondance hellénique* (Vols. XXIII, XXIV, Paris 1899).

CARYOCAR, kă-rī'ō-kär, a genus of plants belonging to the family *Caryocaraceæ*, consisting of lofty trees, natives of tropical America, which produce good timber. They have evergreen, ternate or pinnate leaves, and flowers in racemes. *C. nuciferum*, a species abundant in British Guiana, yields the kidney-shaped souari-nuts, or butternuts. Other species are *C. glabrum* and *C. amygdaliferum*.

CARYOPSIS, the small, peculiar, one-seeded, dry indehiscent fruit of the grasses, as wheat, barley, etc.

CARYOTA, a genus of palms, with doubly pinnate leaves, the best-known species of which (*C. urens*) is a native of most of tropical Asia. It supplies an inferior kind of sago, and from its juice is made toddy or palm-wine. The leaf-stalks yield kittul fibre, which is used in making baskets, brooms, etc.

CARYSFORT REEF, a dangerous coral reef near the southern extremity of Florida, lat. 25° 13′ N., long. 80° 13′ W., lying about five miles east of Key Largo, on which is erected a lighthouse of the first order, 106 feet high.

CASA, kä'zä, **Giovanni della**, Italian writer: b. Mugello, near Florence, 1503; d. Rome, 14 Nov. 1566. He studied in Bologna, Florence and Rome, and entered as an ecclesiatic into the service of the two cardinals Alessandro Farnese, the first of whom in 1534 ascended the papal chair, under the name of Paul III. He rose through various offices in the Church, including the archbishopric of Benevento, till Paul IV made him his private secretary. His most celebrated work is 'Galateo, ovvero de' Costumi' (1560), a manual of good-breeding, to which another book, 'Degli Uffizi communi tra gli Amici Superiori e Inferiori,' forms a supplement. This last is a translation of his Latin treatise, 'De Officiis Inter Potentiores et Tenuiores Amicos.' The best and most complete edition of his works appeared at Venice (1752).

CASA BRACCIO, brăch'ō, Italian romance, by Francis Marion Crawford, published 1896. The first half of the novel is much the better.

CASA GRANDE, grän'dā, or the CASA GRANDE RUIN (see NATIONAL PARKS AND MONUMENTS), the Spanish name (signifying «large house») of the ruins of a prehistoric building in Arizona, near the Gila River, about 12 miles from Florence, Ariz., and somewhat farther from the Casa Grande station. It is the best-preserved structure of a type which was widely distributed. The space enclosed by the walls now standing measures about 43 by 59 feet; and the walls, which are high, show that there were three habitable stories. A large area surrounding this building is covered with mounds and débris of other buildings, indicating that there was originally a considerable settlement on the site. It was set aside, as the most interesting object in a small reservation, by executive order dated 22 June 1892, under the act approved 2 March 1889. By presidential proclamation of 10 Dec. 1909 the boundaries of the reservation were changed by the elimination of 120 acres on which there were no prehistoric ruins and the inclusion of a tract of equal size adjoining the reservation on the east, on which are located mounds of historic and scientific interest. Casa Grande was a ruin when discovered. Since that time the identity of its builders has furnished a theme for speculation; and although it has been ascribed to the Aztec, the better opinion seems to be that the ancient people who inhabited this building were not closely related to any tribes of the Mexican plateau, whose culture was different from that of the sedentary tribes of Arizona. The walls are of a fawn color slightly tinged with red. They are constructed of a cement called *caliche,* composed of lime, earth and pebbles; this was made into blocks, which were laid in courses. Consult Fewkes, J. W., detailed report in Twenty-eighth Annual Report Bureau American Ethnology.

CASABIANCA, kä-zä-bē-än'kä, **Louis,** French naval officer: b. Bastia, Corsica, 1755; d. 1 Aug. 1798. With the Comte de Grasse, he took part in the American Revolution. He sat in the National Convention of 1792; and in 1798 was captain of the flagship *L'Orient* in the expedition to Egypt. He was mortally wounded at the battle of the Nile, 1 Aug. 1798; the ship caught fire; his 10-year-old son would not leave him, and both were killed by the exploding of the ship. The story of their death is the subject of Mrs. Hemans' well-known poem.

CASAL, kä-säl', **Julián del,** Cuban poet: b. 1863; d. 1893. He was a half morbid striver after the super-æsthetic and a pronounced lover of the luxury and elegance of the Orient and of Paris. Endowed with a fervid imagination and a strongly poetic touch he found followers not only in Cuba, but throughout Latin America, and later in Spain itself. None of the countries that he loved and whose manners and customs and modes of thought he imitated, had he ever visited. Highly colored were his mental pictures of them, by wonderful visions from the land of imagination and of dreams in which he lived. Yet, with all his love of beauty, luxury and elegance, he was very much a pessimist and his discontent with life finds constant expression in his writings. He handled the sonnet with a master-hand and made it do duty in picturing the many phases of life into which his active imagination constantly led him. His work covers a wide variety of subjects, ranging from clear-cut pictures of heroic characters of classical Greece, to sketches of native life in Havana, in prose and poetry, and side-stepping at times into politics, society and biography. Casal was an intimate friend of Rubén Darió, the Nicaraguan poet and leader of poetic thought throughout Latin America from 1895 to 1915; and the latter borrowed a number of his reactory ideas from the young Cuban poet, whose writings in *La Habana Elegante* and other periodicals had early made him the leading figure of his day in Cuban literature. Among Casal's published work are 'Hojas al Viento' (1890); 'Nieve' (1891); 'Bustos y Rimas' (prose, 1893). In a study of Jaris Karl Huysmans, he displays his critical ability and his love of the exotic and sensuous. Consult Meza, Ramón, 'Julián del Casel' (Havana 1910).

CASAL, or **CAZAL, Manoel Ayres de.** See CAZAL.

CASALE, kä-sä-lē, or **CASALE DE MONFERRATO,** Italy, city in the province of Alessandria, on the right bank of the Po, 18 miles north-northwest of Alessandria. The citadel, founded by Duke Vicenzo in 1590, was one of the strongest in Italy, and within recent years the fortifications have been greatly strengthened and extended. In 1640 the Spaniards were defeated here by the Duc d'Harcourt, and the possession of the town was repeatedly contested by the Austrians and French during the wars of Napoleon. Casale was the capital of the ancient Montferrat. It is the seat of a bishop and of a district court of justice, and has a cathedral which is said to have been founded in the 8th century. Its church of San Domenico, containing a tomb in memory of the Princess Palæologi, is remarkable for the elegance of its design, and several fine works of art are found in other of its churches. The mediæval history of Casale goes back to its settlement in 730 by Lintprand, on the site of the ancient Roman city Bodincomagus. The church of San Ilario replaced the former pagan temple of worship which stood here. In 1215 Casale was almost totally destroyed by its neighbors, but in 1220 was rebuilt and in 1292 became the property of the marquises of Montferrat. Modern Casale has tramway communication with the neighborhood and nearby is the famous Sacro Monte di Crea with its 18 chapels. Cement, liqueurs, silk, fertilizers, tools and machinery, constitute the chief industries. Pop. about 34,000.

CASALE PUSTERLENGO, pūs-tĕr-lĕn'-gō, Italy, town in the province of Milan, southeast of Lodi, beautifully situated in a fine plain between the Po and the Adda. It has a trade in Parmesan cheese. In 1796 the Austrians were attacked here by the French, and driven back to Lodi. Pop. 7,000.

CASALMAGGIORE, kä-säl-mäd-jō'rē, Italy, a town in the province of Cremona, 15 miles north of Parma, and 22 miles southeast of the city of Cremona (with which there is railway connection), on the left bank of the Po. There are a cathedral and other churches, theatre, etc. The manufactures include pottery and glass-ware, leather and chemicals; and there is a trade in wine, grain, hemp and cheese. In 1448 the Venetians were defeated here by Francesco Sforza. Pop. 17,500.

CASALS, Pablo, Spanish violoncellist: b. Vendrell, Catalonia, 1876. He studied at Barcelona with García and Rodereda, and in 1894 in Madrid with Breton. He made his début in 1898 at one of the Concerts Lamoureux in Paris. His success was immediate and he devoted himself to the concert stage. He has toured Europe and both North and South America where he has been met with much acclaim. His interpretation is excellent and his technique perfect. As a composer, he has won recognition with two symphonic poems, several smaller works for orchestra and numerous pieces for piano and 'cello and for piano and violin.

CASAMICCIOLA, kä-sä-mē'chō-lä, Italy, favorite watering-place on the island of Ischia, beautifully situated in a valley on the north side of Monte Epomeo, with hot springs (158° F.), baths, hotels, etc. The season extends from June to September. By the earthquake of 28 July 1883, the place was almost entirely destroyed, and even at present, although the government has aided in its rebuilding, a considerable part of the town is in ruins. Pop. (1911) 3,490.

CASANARE, kä-zä-nä'rę, a river of the Republic of Colombia, which rises in the mountains of Chita, flows through a region called by the same name, and after an easterly course of 180 miles empties into the Meta, lat. 5° 58' N. It is navigable for small craft.

CASANOVA, kä-sä-nō'vä, **Francesco,** Italian painter: b. London 1727; d. Brühl, near Vienna, 1805. He studied in Florence under Simonini. He went to Venice with his parents, was in Paris in 1751, but after a brief stay went to Dresden, where he remained from 1752–56. Here he studied and copied the paintings of Wouverman. He acquired renown as a painter of battle pieces, and was admitted to the Academy of Fine Arts in 1763. Catherine II of Russia employed him to paint her victories over the Turks. He settled in Vienna in 1785, and the gallery there contains several of his paintings. At Paris he was painter to the King. Among his pictures are 'The Battle of Freiburg,' 'Hannibal Crossing the Alps' and 'The Battle of Lyons.'

CASANOVA DE SEINGALT, kä-sä-nō'vä dĕ säń-gäl, **Giovanni Giacomo,** Italian adventurer: b. Venice, 2 March 1725; d. Dūx, Bohemia, 4 June 1798. The year of his death is uncertain, some maintaining that he lived until 1803. He was the son of an actor and actress; he studied law at Padua, but gave this up to study for the priesthood. He was expelled from the Seminary of Saint Cyprian for a scandalous intrigue, and was also imprisoned for a short time. The influence of his mother procured him a place in the establishment of Cardinal Acquaviva, but he did not retain it long; and after visiting Rome, Naples, Corfu and Constantinople, in the characters of diplomatist, preacher, abbot, lawyer and charlatan, he was imprisoned at Venice in 1755, but escaped owing to his wonderful keenness and skill. In his travels throughout Europe he formed associations with many distinguished characters, Louis XV, Rousseau, Voltaire, Suvaroff, Frederick the Great and Catherine II. His most celebrated work is his 'Memoirs' (1828–38), in which he relates with a cynical freedom the whole of his extraordinary adventures, and presents a picture of society without conventional disguise. Among his dupes were Mme. de Pompadour, Frederick the Great, and even that other prince of charlatans, Cagliostro. Besides his 'Memoirs,' Casanova was the author of several works of history or imagination in French and Italian, which show the versatility of his genius. The most remarkable are 'Récit de sa Captivité' (1788), and a translation in verse of the Iliad. His 'Memoirs' are now recognized as of important historical value as a portrayal of private life in the 18th century. A complete critical edition is in preparation by Brockhaus of Leipzig from the original text. The general reliability of the 'Memoirs' is attested by 'Lettre di donne a G. Casanova,' edited by Ravá (Milan 1912). Consult Ravá, 'Contributo alla bibliographia di G. Casanova' (Turin 1910); Maynial, 'Casanova et son temps' (Paris 1911); Symonds, 'Casanova at Dūx' (in *North American Review,* 1902).

CASARTELLI, Louis Charles, English Roman Catholic prelate and writer: b. Manchester, England, 14 Nov. 1852. He was educated at the Salford Grammar School, Ushaw College and Louvain University. He was ordained to the priesthood in 1876; was professor at Saint Bede's College, Manchester, 1877–91, and was rector there from 1891–1903. He edited *Illustrated Catholic Missions* in 1889–1903 and from 1900–03 was professor of Zend and Pahlavi languages at Louvain University. In 1903 he was consecrated bishop of Salford. He has been lecturer on Iranian languages at Manchester University. In 1908–10 he was president of the Dante Society of Manchester and of the Manchester Egyptian Association. He represented the universities of London and Manchester at the jubilee of Louvain University. He is president of the Manchester Oriental Society and member of the Royal Asiatic Society. He has published 'Lectures on Commercial Geography' (1884); 'La philosophie religieuse du Mazdéisme sous les Sassanides' (1884); 'Traité de médicine Mazdéenne' (translated from Pahlavi 1886); 'Sketches in History' (1906). He contributed to the 'Catholic Encyclopedia'; was a collaborator in 'Encyclopædia of Religion and Ethics.' He is a frequent contributor of articles on religious and Oriental topics to periodicals.

CASAS, kä'säs, **Bartolomé de las,** Spanish prelate, better known as "the Apostle of the Indies:" b. Seville 1474; d. Madrid, July 1566. In his 19th year he accompanied his father, who sailed with Columbus, to the West Indies. Five years afterward he returned to Spain, and pursuing his studies he entered the priesthood. He accompanied Columbus in his second voyage to Hispaniola (Haiti), and on the conquest of Cuba settled there, and distinguished himself by his humane conduct toward the oppressed natives. He set at liberty the Indians who had fallen to his share in the division; and so much was he interested for them, that in 1516 he went to Spain to lay a statement of their case before King Ferdinand, whose death at that time prevented any measures for their benefit. The regent, Cardinal Ximenes, however, appointed a commission to examine circumstances on the spot, and to determine accordingly. Las Casas was to accompany them, with the title of Protector of the Indians. The commissioners found that it was impossible to liberate the Indians, and therefore endeavored to secure their humane treatment; but Las Casas, still dissatisfied, remonstrated so warmly that he was obliged to take refuge in a convent from the rage of the planters. He again returned to Europe; and on the accession of Charles V, in consequence of his representations, the council appointed a chief judge to re-examine the points of controversy between the partisans of Indian liberty and the colonists. Las Casas, in his zeal for the Indians, became the author (or the encourager at least) of the slave-trade, by proposing to purchase negroes from the Portuguese in Africa to supply the planters with laborers, of the want of whom they complained; and this was unfortunately put into execution. He next applied for a grant of an unoccupied tract, in order to try his own plan with a new colony. This he at length obtained, and with 200 persons, whom he persuaded to accompany him, landed at Porto Rico in 1521, but found that an expedition was advancing to ravage this very tract, and convey its inhabitants to Hispaniola as slaves. He endeavored in vain to prevent the threatened danger, and with the few who still adhered to him returned to Hispaniola to solicit succor. During his absence the natives attacked the colonists with such success that in a short time not a Spaniard remained in that part of South America. Las Casas, in despair at the failure of his project, retired to the Dominican convent at Saint Domingo, and assumed the habit of the order. Notwithstanding his retirement his zeal in the cause of the Indians did not abate; and being sent on a mission to Spain by a chapter of his order at Chiapas in 1542, he pleaded their cause with his pristine warmth, and composed his famous treatise 'Brevisima Relacion de la Destrucción de las Indias,' in which he exposed the cruelties practised by the Spaniards. His unremitting perseverance at length obtained a new set of laws and regulations, by which the natives were greatly relieved. In 1544 he returned to America as bishop of Chiapas, but left it three years later, and resigned his bishopric in 1550. Besides the treatise above named he wrote 'Historia de las Indias.' This was first printed in 1875–76. It is one of the most notable of books, not only in its contents,— as a history of Spanish discoveries from 1492 to 1520, and a contemporary Spanish Catholic criticism as well as story of Columbus,— but in the circumstances which prevented its publication for more than 300 years, and which still leave it inaccessible except to readers of Spanish. Consult Llorente, 'Œuvres de las Casas' (1822); Quintana, 'Vidas de Españoles Célebres'; Helps, 'Life of Las Casas and Spanish Conquest' (Philadelphia 1868); Fabie, 'Vida y Escritas de Las Casas' (Madrid 1879); Sabin, 'Works of Las Casas' (New York 1870); Prescott, 'Conquest of Mexico' (Philadelphia 1902); MacNutt, F. A., 'Bartholomew de Las Casas' (New York 1909).

CASAS GRANDES, kä'säs grän'däs (Span. «great houses»), a town in Chihuahua, Mexico, on the Casas Grandes or San Miguel River, 35 miles south of Llanos, and 130 miles southwest of El Paso, remarkable for a number of ruins, apparently relics of an aboriginal race. These ruins are found about half a mile from the small Mexican village, partly on the declivity of a small hill, and partly on the plain at its foot. They consist chiefly of the remains of a large edifice of the pueblo type, built entirely of a substance resembling adobe, mud mixed with gravel and straw and formed into blocks 22 inches thick and about three feet long. The portions which must have been constructed of wood have entirely crumbled away. The outer walls are almost all prostrate, except at the corners, and were probably only one story high; the inner walls are better preserved, varying in height from 5 to 50 feet, and being in some cases five feet thick at the base. The portions remaining erect seem to indicate an original height of from three to six stories. The doorways have the tapering form noticed in the ancient structures of Central America and Yucatan, and over them are circular openings in the partition walls. The stairways were probably of wood and placed on the outside. Clavigero, in his 'History of Mexico,' tells us that the building, according to popular tradition, was erected by the Mexicans in their peregrination, and that it consisted «of three floors, with a terrace above them, and without any entrance to the lower floor. The door for entrance to the building is on the second floor, so that a scaling ladder is necessary.» The main features of the edifice seem to have been three large structures connected by ranges of corridors or low apartments, and enclosing several courtyards of various dimensions. The extent from north to south must have been 800 feet, and from east to west about 250 feet. A range of narrow rooms lighted by circular openings near the top, and having pens or enclosures three or four feet high in one corner, supposed to be granaries, extends along one of the main walls. Many of the apartments are very large, and some of the enclosures are too vast ever to have been covered by a roof. About 200 feet west of the main building are three mounds of loose stones and 200 feet west of these are the remains of a building, one story high and 150 feet square, consisting of a number of apartments ranged around a square court. The inhabitants of this communal structure seem to have disappeared long before the Spaniards noticed the ruins in the latter part of the 17th century. Throughout the northern part of Mexico the name Casas Grandes is applied to deserted buildings of a similar type.

For some distance south the plain is covered with tracts of ancient buildings, and for 20 leagues along the Casas Grandes and Llanos rivers are found artificial mounds from which have been dug up stone axes, corn-grinders and various articles of pottery, such as pipes, jars, pitchers, etc., of a texture far superior to that made by the Mexicans of the present day, and generally ornamented with angular figures of blue, red, brown and black, on a red or white ground. The best specimens command a high price in Chihuahua and neighboring towns. On the summit of a mountain, about 10 miles from the ruins above described, are the remains of an ancient stone fortress, attributed to the same people who built the Casas Grandes, and probably intended as a lookout. See PUEBLOS.

CASATI, kä-sä'tē, **Gaetano,** Italian explorer in Africa: b. Lesmo, Italy, 1830; d. Como, 7 March 1902. He entered the army of Piedmont at 21, and resigning in 1879 went to Africa, commissioned by the Società d'Esploragione Commerciale d'Africa. He followed the Welle River and explored the basin of the Bahr-el-Ghazal. He joined his countryman, Gessi Pasha, there, but the schemes of the Mahdi in 1883 shut him up in the Niam-Niam region with Emin Pasha. At the request of the latter he consented to act as "President" in King Kabba Rega's country, but after being at first well treated by that monarch he was later condemned to death. Escaping with great difficulty to the Albert Nyanza Lake, and losing all his notes and manuscripts, he was finally rescued by Emin Pasha in 1888. The expedition of Stanley came a little later to the relief of both. On his return to Italy Casati published a volume descriptive of his adventures, entitled 'Dieci anni in Equatoria.'

CASAUBON, kă-zō-bôṅ, **Isaac**, Swiss classical scholar and theologian: b. Geneva 1559; d. London about July 1614. In his ninth year he spoke Latin fluently. In his 19th year he entered the university at Geneva, where he studied Greek, theology, the Oriental languages, etc., and in 1582 succeeded Portus as professor of the Greek language. In 1586 he married the daughter of the famous printer, Henry Stephens, In 1596 he accepted a professorship of Greek and *belles lettres* at Montpellier, but held it only two years. In 1600 Henry IV invited him to Paris. His Protestantism, the jealousy of other scholars, and perhaps his rather unyielding character, were the occasion of many unpleasant occurrences, for which, however, he was indemnified by the office of royal librarian. After the death of Henry IV in 1610 he went to England on the invitation of the archbishop of Canterbury, where he was received with distinction, was presented with a prebend in Canterbury Cathedral, and had a pension conferred on him by James I, with whom he was a great favorite. He was buried in Westminster Abbey. Casaubon was a liberal theologian, a man of extensive learning, a good translator and an excellent critic. As a critic, he commented on Diogenes, Laertius, Aristotle, Theophrastus, Suetonius, Persius, Polybius, Theocritus, Strabo, Dionysius of Halicarnassus, Athenæus, Pliny the Younger, etc. Nearly all the ancient classics are indebted to his valuable researches. His profound dissertation on the satirical poetry of the Greeks and the satire of the Romans ('De Satyrica Græca Poesi et Romanorum Satira') deserves particular praise. His theological writings are of less value. His diary, which had been preserved by his son, Meric, was edited by Russell (Oxford 1850) under the title of 'Ephemerides.' Casaubon's 'Letters' were published at Rotterdam (1709). A 'Life of Casaubon' was written by Mark Pattison (1875; id. ed., ed. by Nettleship, Oxford 1892). Consult also Nozelle, 'Isaac Casaubon, sa vie et son temps' (Paris 1897).

CASAUBON, Meric, son of the preceding, Swiss classical scholar in England: b. Geneva, 14 Aug. 1599; d. Oxford, 14 July 1671. He went to school at Sedan, and in 1611 followed his father to England, and studied at Eton and Christ Church, Oxford. He held successively several livings in the Church, when the revolution, which brought Charles I to the scaffold, deprived him of his income. Still he rejected the proposal of Cromwell to write the history of his time, as also the invitation of Queen Christina to live in Sweden. On the return of the Stuarts he was rewarded for his loyalty by restoration to his offices in the Church, which he held till his death. Besides various works in Latin, he wrote several in English on theological and other subjects. Through the efforts of Charles I, he became doctor of divinity. He also wrote some critical works on the classics, a treatise, 'De Verborum Usu' (1647), etc.

CASBIN. See KASBIN.

CASCA, Publius Servilius, Roman statesman: d. 42 B.C. He assisted in the assassination of Julius Cæsar in 44 B.C., and, according to Plutarch, he struck the first blow, in the back of the neck.

CASCADE MOUNTAINS, a range in the western United States and Canada, the northward continuation of the Sierra Nevada (q.v.). The range begins in California near the Oregon boundary and extends across Oregon and Washington into British Columbia. It parallels the Pacific coast at a distance of from 100 to 150 miles. The Columbia River and the Klamath have cut their way across the southern portion of the range and the Fraser River passes across the northern end. The range is extremely rugged in outline. The greater part of its mass is composed of igneous and volcanic rocks. Firs, pine and hard wood cover a goodly portion of the slopes. The highest peaks are Mount Shasta, 14,380 feet; Mount Hood, 11,225 feet; Mount Jefferson, 10,200 feet; Mount Rainier (Tacoma), 14,363 feet; Mount Baker, 10,500 feet; Mount Adams, 12,470 feet. Some summits are recently extinct volcanoes and there are large snowfields, which feed several glaciers. The range was first folded about the close of the Jurassic. During Tertiary time it was re-elevated, with the outpouring of great lava sheets.

CASCAPEDIAC RIVER, Great, a river of Canada, in the province of Quebec, flowing southeast into Chaleur Bay. Its length is 150 miles.

CASCAPEDIAC RIVER, Little, a river of Canada, in the province of Quebec, east of the Great Cascapediac, and with an almost parallel but shorter course.

CASCARA SAGRADA, the bark of a northwestern tree (*Rhamnus Purshiana*, or California buckthorn), of the natural order *Rhamnaceæ*. The composition of cascara is extremely complex, but its main action is due to the volatile oils, the anthracene resins, at least three, the amaroids and the tannin, malic and oxalic acids. It stimulates peristalsis, increases the intestinal juices and has marked effects on general excretion. It is an excellent laxative and one of the very best cathartics for habitual and chronic constipation. It is best used in the form of a fluid extract. Because of its valuable properties, many patent drugs with similarly sounding names have been foisted on the public. These mostly contain other and more powerful and pernicious cathartics. See BUCKTHORN.

CASCO BAY, a bay on the southwest coast of Maine. It is about 20 miles wide and so deep as to constitute one of the best harbors of the world, for all kinds of vessels. It contains many islands. Portland is located on the west side.

CASE, Augustus Ludlow, American naval officer: b. Newburg, N. Y., 3 Feb. 1813; d. Washington, D. C., 17 Feb. 1893. He entered the navy as a midshipman in 1828. In the Mexican War he took part in the capture of Vera Cruz and Tabasco, and during the Civil War served as fleet captain of the North Atlantic blockading squadron. He took part in the capture of Forts Hatteras and Clark, and cut out the blockade-runner *Kate,* under the fire of the forts at New Inlet, N. C. He was a lighthouse inspector in 1867; chief of bureau of ordnance, 1869; commander of the European squadron in 1873; was placed in command of the fleet at Key West at the time of the *Virginius* affair; and was retired in 1875, with the rank of rear-admiral.

CASE, Leonard, American philanthropist: b. Cleveland, 27 June 1820; d. 6 Jan. 1880. He was graduated at Yale College in 1842, and continued to pursue literary and scientific studies, contributing to the best magazines. Inheriting from his father a large estate in the city of Cleveland, he deeded a certain part of it for the founding and maintenance of an educational institution, which was incorporated after his death as the Case School of Applied Science (q.v.).

CASE, Theodore Spencer, American physician: b. Jackson, Ga., 26 Jan. 1832; d. Kansas City, Mo., 16 Feb. 1900. He was graduated at Marietta College in 1852 and at the Starling Medical College, Columbus, Ohio, in 1856. In 1883 he received the honorary degree of Ph.D. from the University of Kansas. Subsequent to the receipt of his medical degree he settled in Kansas City, and from 1860 to 1861 edited the *Medical Review* there, also holding the office of alderman in 1860. He became second lieutenant of the 25th Missouri infantry in June 1861, and later captain and assistant quartermaster. In February 1865, he was made colonel and quartermaster-general of Missouri, and in 1866-68 was curator of the University of Missouri. From 1873 to 1885 he was postmaster of Kansas City and in 1885 became professor of chemistry in Kansas City Medical College. He edited the Kansas City *Review of Science and Industry* from 1877 to 1885, and in 1886 became president of the Kansas City real estate and stock exchange.

CASE, Thomas, English philosophical scholar. He was educated at Rugby and Balliol College, Oxford, was Waynflete professor of moral and metaphysical philosophy at Oxford from 1889 to 1910, and was appointed president of Corpus Christi College in 1904. He has published 'Materials for History of Athenian Democracy from Solon to Pericles' (1874); 'Realism in Morals' (1877); 'Physical Realism' (1888); 'Saint Mary's Clusters' (1893).

CASE, *in grammar,* a form, modification or inflection of a noun or pronoun, indicating or corresponding to its relationship to some other word or words in a phrase or sentence, as, John (nominative case) speaks; John's (possessive) dog barks; John beats his dog (objective). In adjectives, case is merely sympathetic, the adjective agreeing in case with the noun which it qualifies. In English, nouns undergo only one inflection representing a different case from the nominative or general form of the noun; all other cases are represented either by prepositions or by the position of the noun in the sentence, the nominative case usually preceding the verb, the objective or accusative following it. The single inflected case in English is the possessive or genitive (John's). English pronouns have three cases — nominative, genitive and accusative, as *he, his, him.* The last often serves as a dative. Adjectives undergo no modifications in English. In Sanskrit there are eight cases — nominative, accusative, instrumental, dative, genitive, ablative, locative and vocative. In Latin there are six cases — nominative, genitive, dative, accusative, vocative, ablative. In Greek there are five, the ablative not being used. In both Latin and Greek there are traces of a locative case. In French, Italian, Spanish and Portuguese, the nouns have no case-inflections. In German both nouns and adjectives are inflected for case. There are four cases in German — nominative, genitive, dative, accusative.

In law, the word has various meanings. An «action upon the case» is one in which damages are sued for, for some cause of complaint where the injury done is not direct, as in trespass, but consequential. A «case stated» is a statement prepared by one court for the decision of a point of law by a superior court. A «special case» is a written statement of facts agreed on by two or more litigants in an action, in order that a court may decide their legal effect. In the United States the term is used in brief for «case on appeal,» meaning the statement laid before a court of appeal by an appellant and presenting the complete record of the original trial in the lower court. Thus the appellate court is allowed to review the findings as well as the points of law involved and here case differs from a «bill of exceptions» in which points of law only are submitted for the consideration of the appeal court. «Case reserved» is a statement drawn by counsel and certified by the judge, to be used as a basis for argument on points of law before a full bench of the court.

In letter-press printing, a case is a receptacle for types, generally made of wood, 34 inches long, 15 inches wide and 1¼ inches deep, and divided into compartments or «boxes,» each of which contains types of one class or letter. A pair of cases consists of an upper and a lower case; the upper one has 98 boxes, and contains the capitals, small capitals and some other signs that are only occasionally required in composition; the lower one has 54 boxes, and holds the letters of the small characters, figures, spaces and most of the points. Thus the small characters are habitually spoken of by printers as «lower-case» letters, and the capitals, etc., as «upper-case» letters. The places assigned to the several letters of the alphabet in the boxes of the case are not precisely the same in all printing-offices, but the differences are few. The different sizes of the boxes in the lower case depend upon the comparative frequency with which the several letters occur in the composition, and the position in the case allotted to each letter is such as to afford the greatest facility in composing. The letter *e,* which is most run upon in the English language, has a box much larger than any of the other compartments, and is placed directly in front of the compositor. In the upper case the boxes are of uniform size, and the letters are placed in nearly alphabetical order, the comparatively rare occurrence of capitals rendering it less important which letter is nearest the compositor's hand. Cases are mounted in a slanting position upon a frame of convenient height.

Cases are named from their use or construction, as «Italic case,» a two-third case for holding Italic type; «two-third case,» a single case in which two-thirds of the space is equivalent to the ordinary lower case, and the remaining third is occupied by the capitals, etc.; «job case,» a single case suited to holding a small job font of type; «rule case,» a case for holding brass rule; «sort-case,» a case for containing «sorts.» The manufacture of cases has received a serious set-back since the introduction of type-composing machines. See PRINTING.

CASE-HARDENING, the process of converting the surface of certain kinds of malleable-iron goods into steel, thereby making them harder, less liable to rust and capable of taking on a better polish. Fire-irons, gunlocks, keys and other articles of limited size, are very commonly so treated, but the process is sometimes applied to large objects, such as iron railway-bars. The articles are first formed, and heated to redness with powdered charcoal or cast-iron, the malleable iron taking carbon from either of these to form a skin of steel upon it; the heated objects are then cooled in cold water, or in oil when they are of a delicate nature. Yellow prussiate or potash or parings of leather have also been a good deal used for coating iron articles with steel by heating them together. Some chemists consider that in this case nitrogen combines with the iron and effects the hardening. The coating of steel is very thin, seldom exceeding one-sixteenth of an inch. Where a thicker coating is needed the articles are treated several times. The so-called «Harveyizing» process of hardening steel armor plate is similar to case-hardening in that the surface is made very resistant to the entrance of projectiles by heat treatment in carbon, while the back is softer and tough in order to resist the smashing effect of the projectile after it has penetrated the hardened surface. A Swedish ironmaster has found that a very excellent case-hardening is obtained by treating iron or steel objects with a mixture of animal matter, such as rasped leather or horn, and arsenious acid dissolved in hydrochloric acid, and heating as usual. Charcoal alone is also used with success.

CASE SCHOOL OF APPLIED SCIENCE, The, at Cleveland, Ohio, founded by Leonard Case (q.v.) of that city. In 1877 a deed of trust was executed setting apart certain real estate for the support of the institution, the deed to take effect upon his death, which occurred in 1880. The Case School was incorporated 29 March 1880. Instruction began in 1881, with a class of 16 students, the school being carried on from that time until the summer of 1885 in the old Case homestead. A commodious building having been erected for the use of the school, it was occupied at the beginning of the term in September 1885. A year later the building with all that it contained was destroyed by fire. It was promptly rebuilt and occupied in 1888. Since that time several additional buildings have been erected, with superior apparatus and appliances. The Case School of Applied Science offers six regular courses of instruction, each requiring four years. They are civil engineering, mechanical engineering, electrical engineering, mining engineering, physics and chemistry. There are 53 professors and instructors and 557 students. The degree of bachelor of science is granted to all who complete one of the regular courses. That of master of science may be conferred upon graduates who have devoted at least one year exclusively to graduate study. Professional degrees, namely, civil engineer, mechanical engineer, electrical engineer and engineer of mines may also be conferred after one year of graduate study or after professional work in positions of responsibility, for three years after graduation. The property left by Mr. Case as an endowment for the support of the school is valued at about $2,500,000, and the amount invested in buildings and equipment is about $1,000,000. The school derives its support in part also from tuition fees. Its government rests with a corporation consisting of 20 men, from whom six, known as trustees, are selected.

CASE-SHOT, a projectile formed by putting a quantity of bullets into a cylindrical tin box called a «canister,» that just fits the bore of the gun. In case of necessity, the canister is filled with broken pieces of iron, nails, stones, etc. The case is closed at both ends by a disc of wood or iron. Shot of this sort is thrown from cannons and howitzers, and is very injurious to the enemy, because the balls contained in the canister spread, diverging in proportion to the distance. The balls vary in weight, according to the character of the ordnance, from one or two pounds to half an ounce each. The range within which case-shot are used sometimes extends to 500, but seldom exceeds 200 to 300, yards. It is also called «canister-shot.» The shrapnel-shell, in its present cylindrical shape, may be considered a variety of case-shot. See ORDNANCE.

CASE-WORM. See CADDIS-FLY.

CASEIN, kā'sē-ĭn (Lat. *caseus,* «cheese») a colloidal substance resembling albumen in its general constitution, and obtained from milk. The older chemists gave the name «casein» both to the precipitated substance that is now known by that name, and to the corresponding substance as it exists in solution in the milk; but it is the scientific practice at the present time to distinguish the latter as «caseinogen.» Caseinogen is the principal nitrogenous constituent of milk, in which it occurs to the extent of about 3 per cent, forming 80 per cent of the proteid content. It is precipitated by a curdy mass, when acetic acid or a mineral acid is added to milk that has been previously diluted by the addition of its own bulk of water. If the caseinogen so prepared is made into a paste and then treated with a small quantity of rennet, the mass sets at once into a solid clot, consisting of true casein; but Hammarsten has shown that if the caseinogen is first washed entirely free from calcium phosphate, rennet is without action upon it. The precise function of the calcium phosphate is obscure, and the same may be said of the chemical relations of the proteids in general. If rennet is added to fresh milk a bulky deposit of casein and butter fat comes down immediately; but to obtain the casein in pure form, the oily matters in the milk should be first removed by the action of a centrifugal separator. Caseinogen is not precipitated by heat, nor does it (like fibrinogen) coagulate spontaneously. The coagulation observed when milk is boiled is due to the albumen present, and not to the casein; and that which occurs upon standing may be due either to the generation of lactic acid through the fermentation of the lactose present, or to the rennet-like action of the ptomaines liberated by micro-organisms that happen to fall into the milk from the air. According to the analyses of Chittenden and Painter, the elementary percentage composition of casein is as follows: Carbon, 53.30; hydrogen, 7.07; nitrogen, 15.91; sulphur, 0.82; phosphorus, 0.87; oxygen, 22.03. Casein is insoluble in water, alcohol or ether, but dissolves easily in alkaline solutions. It also dissolves in very weak hydrochloric acid, from which it is again precipitated upon the addition of the same reagent in more concentrated form. Casein for commercial purposes is prepared almost wholly from cow's milk. The milk is first put through a centrifugal separator to remove the fat, and then from 4 to 6 per cent of caustic alkali is added. The milk is then run into a vat, and dilute sulphuric acid is added, the whole being stirred constantly. When the curd has settled it is washed with cold water and drained on cheesecloth filters. It is pressed in a cheese press as dry as possible, and then broken up into very small pieces in a curd mill; after which it is dried at a low temperature in a vacuum. The chief use of casein in the arts is as a glue. In this form it is widely utilized in the wall paper industry in the production of washable wall papers, and also in the production of enameled papers, in which casein glue is used as the binder for the materials of the enamel coating. It is also used in the making of erasable tablets, paper «slates,» etc. As a binder for various «fillers» many solid articles are produced in imitation of ivory and tortoise-shell. A compound of casein and lime is made use of in the dyeing industry for «animalizing» cotton fabrics so that the fibres will retain the colors applied to them. In medicine, casein is being more and more employed, its combination with certain drugs immensely enhancing their efficacy. This is particularly marked in the administration of iodine, phosphorus, arsenic, mercury and iron, as well as many alkaloids and organic compounds. See PROTEIDS. Consult Hammarsten-Mandel, 'Physiological Chemistry' (New York 1914); Sherer, R., 'Casein: Its Preparation and Technical Utilization' (London 1906).

CASEMATES (Sp. *casa*, «a house,» and *matare*, «to kill»), in fortification, vaults which are proof against bombs, and which may be constructed under a parapet and provided with embrasures or ports through which guns are fired. They may serve, at the same time, as a place for keeping the heavy ordnance and various stores, and in case of necessity as habitations for the garrison or shelter for sick or wounded.

CASEMENT, SIR Roger, Irish revolutionist: b. Ireland, 1 Sept. 1864; executed in London, 3 Aug. 1916. Though born in Ireland, Casement was of English parentage and a Protestant by creed. He entered the British consular service at the age of 28, and served in the Niger Coast Oil Rivers Protectorate from 1892 to 1895, when he was appointed consul in the Portuguese province of Lorenzo Marques. In 1898 he was made consul for the Portuguese possessions in West Africa, south of the Gulf of Guinea. During the war in South Africa he was engaged on special service at Cape Town in 1899 and 1900, and on the conclusion of hostilities he was decorated with the Queen's medal. In 1900 Casement was transferred to the Belgian Kongo, and in 1901 was appointed to act as consul also for part of the French Kongo. In 1905 he was made a C.M.G. and in the following year was appointed consul for the state of São Paulo. His next promotion took place in 1908, when he was made British consul-general at Rio de Janeiro. Between 1909 and 1912 he was employed in making inquiries relative to the rubber industry atrocities, and retired on a pension in 1913 after an honorable and useful career. He received his knighthood in June 1911, on which occasion he wrote the following letter to the Secretary of State for Foreign Affairs:

> "I find it very hard to choose the words with which to make acknowledgment of the honour done me by the King. I am much moved at the proof of confidence and appreciation of my services on the Putumayo, conveyed to me by your letter, wherein you tell me that the King had been graciously pleased, on your recommendation, to confer upon me the honour of knighthood. I am indeed grateful to you for this signal assurance of your personal esteem and support. I am very deeply sensible of the honour done to me by his Majesty. I would beg that my humble duty might be presented to his Majesty, when you may do me the honour of conveying to him my deep appreciation of the honour he has been so graciously pleased to confer upon me. I am, dear Sir Edward Grey," etc.

In view of his tragic end and the circumstances that brought it about, this expression of Casement's sentiments was strangely at variance with his subsequent action during the European War. Suspicion was first directed toward him a few months after the war broke out, when it became known that Casement was moving about at large in Germany at a time when all British subjects in that country were either interned or under police supervision. Questions were asked in the British Parliament, and Casement's pension was withdrawn on 30 Sept. 1914, up till which time it had been paid to him. A large number of British prisoners of war had fallen into German hands between September and December 1914. In the latter month a great many Irish soldiers were collected in a large camp at Limburg, apparently for a special purpose. These prisoners were assembled on several occasions and addressed collectively and individually by Casement, who moved about the camp freely with the full approval of the German authorities. He introduced himself as Sir Roger Casement, the «organizer of the Irish volunteers.» Telling the men that he was forming an Irish brigade, he invited all Irish prisoners to join it. Those who agreed, he said, would be sent to Berlin as the guests of the German government, and that, if Germany won a sea battle, the «Irish brigade» would be landed in Ireland to fight against England. In the event of Germany losing the war, each man would receive from

Casement or the German government $50 or $100 and a free passage to America. Those who renounced their allegiance were given a green uniform with a harp worked on the collar and provided with German side arms. About the middle of April 1916 Casement and an Irish soldier named Bailey, together with a «Mr. Monteith,» were put on board the German submarine U-19 at Wilhelmshaven. They sailed round the Shetlands and the west coast of Ireland. Meanwhile, a small Wilson liner, disguised as a timber ship and carrying 10 machine guns, bombs, 20,000 rifles and millions of cartridges, had been sent from Germany to a place near Tralee. When the submarine had reached as near land as possible before dawn, Casement, Monteith and Bailey were put into a collapsible boat, armed with revolvers and ammunition. The boat overturned and the adventurers had to wade ashore, where they buried the weapons. Casement remained behind; the other two made their way to Tralee by land. On Good Friday, 21 April 1916, the British sloop *Bluebell* was patrolling near Tralee when she sighted a suspicious vessel flying the Norwegian ensign and with four of those ensigns painted forward and aft on each side. In reply to signals she said she was the *Aude*, bound from Bergen to Genoa. The ship was ordered to follow the *Bluebell* to harbor, but when about a mile and a half from the Daunt Rock lightship (near Queenstown), the *Aude* suddenly raised two German naval ensigns and blew up, sinking immediately. The crew, who had destroyed the ship, clambered into two boats and surrendered to the *Bluebell*. The collapsible boat from the submarine was found by a farmer at four in the same morning on which Casement had landed. A tin box containing pistol cartridges was exhumed. The police searched the neighborhood and discovered Casement hiding in an excavation known as McKenna's Fort. He gave his name as Richard Morton, of Denham, Buckinghamshire, and described himself as an author. He was taken to Ardfert Barracks, and on the way dropped a paper, which was found to be a cipher code. Some of the sentences read, «Cannons with plenty of ammunition are needed. Send them to ——»; «Send more explosives,» etc. Casement was taken to England the next day and handed over to the metropolitan police, when he disclosed his identity. He was tried before the lord chief justice and a jury on 26 June, found guilty of high treason and sentenced to death. The penalty was carried out at Pentonville Prison, at 9 A.M. on 3 August. Many prominent persons both in Great Britain and the United States made strenuous efforts to save Casement from the gallows, but in vain. The grounds on which the British government refused a reprieve — after Casement's appeal had failed — were thus stated by Lord Robert Cecil in Parliament: «No doubt of Casement's guilt exists. . . . The only ground for a reprieve would be political expediency, a difficult ground to put forward in this country. This country never could strain the law to punish a man for the same reason that it could not strain the law to let him off. . . . The Irish rebellion began with the murder of unarmed people, both soldiers and police. No grievance justified it and it was purely a political movement organized by a small section of Irish people who still hate England and was assisted by Germany. . . .» Shortly before his execution Casement was received into the Roman Catholic Church. He was unmarried. In November 1917 the *Volksrecht* of Zürich, Switzerland, the official organ of the Swiss Social Democrats, published a number of German official documents relating to Casement's activities in Germany. One of them gives the agreement signed between Casement and the German Foreign Minister, Herr von Zimmermann. Nine of these documents were reproduced in the New York *Times* of 16 Dec. 1917. See IRELAND — REVOLUTION.

CASERTA (formerly TERRA DI LAVORO), a province of Italy, north of Naples, along the Mediterranean Sea. Its chief industries are agriculture and cattle raising; there are also some flourishing manufactures. Area, 2,033 square miles. Pop. 749,414.

CASERTA, kä-zär'tä, Italy, capital of the province of Caserta, 17 miles northeast of Naples. It is the seat of a bishop, and contains many fine buildings. The principal edifice is a palace, one of the finest in Europe, a large and richly decorated structure commenced in 1752 by Charles III of Spain, and designed by Vanvitelli. This magnificent edifice forms with its four courts a huge rectangle, whose south side is 830 feet long and 134 feet high, and has 37 windows in each story. Through the middle of the rectangle runs a splendid colonnade 541 feet long, from the centre of which rises the beautiful marble stairway with 116 steps. The chapel of the palace is richly decorated and contains many noteworthy works of art. The theatre of the palace has 40 boxes and 12 Corinthian columns of African marble from the palace of Serapis at Pozzuoli. The water for its fountains is brought 26 miles from Mount Taburno by an aqueduct which crosses the Maddeloni Valley on a daringly constructed bridge, 1,700 feet long and 190 feet high, and situated among gardens adorned with numerous ancient and modern statues. The principal manufactures are silk goods, carpets, linen, etc. The district produces excellent fruit and wine. About two and a half miles to the northeast is Caserta Vecchia (Old Caserta), the new town being distinguished as Caserta Nuova. In 1860 Caserta was the headquarters of Garibaldi and his army. The province of Caserta is the ancient Campania Felix. Pop. 33,000.

CASEY, Silas, American army officer: b. East Greenwich, R. I., 12 July 1807; d. Brooklyn, 22 Jan. 1882. He was graduated from the United States Military Academy at West Point in 1826; served in the Mexican War, being present at the battles of Contreras, Churubusco, Molino del Rey and the siege of Chapultepec. When the Civil War broke out he was given charge of organizing the volunteers near Washington; later served in the Army of the Potomac, and won much distinction at Fair Oaks; was president of the board to examine candidates for officers of colored troops in 1863–65; brevetted major-general, U. S. A., 13 March 1865; and retired in 1868. His publications include 'System of Infantry Tactics' (1862); and 'Infantry Tactics for Colored Troops' (1863).

CASEY, Thomas Lincoln, American military engineer: b. Sackett's Harbor, N. Y., 10 May 1831; d. Washington, D. C., 26 March 1896. He was graduated from West Point in 1852, and entered the engineer corps of the army. During the Civil War he was superintending engineer of defenses on the coast of Maine, and on special duty with the North Atlantic squadron in the first expedition against Fort Fisher. In 1865 he was brevetted colonel for gallant services during the war. In 1868 he was put in charge of one of the departments in the chief engineer's office at Washington; in 1873 was sent abroad for professional service; and in 1877 was placed in charge of the construction of the state, war and navy building, and of the Washington aqueduct, and also of the Department of Public Buildings and Grounds. Later he built the White House conservatory and the Army Medical Museum, completed the Washington monument and took charge of the construction of the Congressional Library. He was president of the board of engineers for fortifications at New York in 1886–88; was promoted chief of engineers and brigadier-general in 1888; and was elected to the National Academy of Sciences in 1890.

CASEY, Timothy, Canadian Roman Catholic bishop: b. Flumeridge, County Charlotte, New Brunswick, 20 Feb. 1862. He was educated at Saint Stephen Grammar School, Saint Joseph's College, Memramcook, and Laval University. After his ordination to the priesthood in 1886, he became successively curate at Fredericton, rector of the cathedral of Saint John, chancellor of the diocese, and rector of Saint Dunstan's Church, Fredericton. In 1899 he was appointed bishop of Utica and coadjutor to Bishop Sweeny of Saint John, being consecrated 11 Feb. 1900, and he succeeded to the bishopric 25 Mar. 1901. He was appointed archbishop of Vancouver 2 Aug. 1912. He attended the Eucharistic Congress at Montreal in 1910, and is known as an ardent temperance reformer.

CASGRAIN, kăs-grăṅ', **Henri Raymond,** French Canadian author: b. Rivière Buelle, Quebec, 1831; d. Quebec 1904. He was educated at Collège Sainte Anne and Quebec Seminary, and was ordained to the priesthood in 1856. He relinquished the ministry in 1872, owing to an affection of the eyes, and subsequently devoted himself to literature. His works include ‹Légendes Canadiennes› (1860); ‹Histoire de la Mère Marie de l'Incarnation› (1864); ‹Histoire de l'Hôtel-Dieu de Quebec› (1878); ‹Pèlerinage au Pays d'Evangeline,› which was crowned by the French Academy (1885); ‹Biographies Canadiennes› (1885); ‹Montcalm et Lévis› (1891); ‹Une Seconde Acadie› (1894); ‹Les Sulpiciens et les prêtres des Missions étrangères en Acadie› (1897).

CASGRAIN, Philippe Baby, Canadian lawyer, statesman and historian: b. Quebec 1826. A student of Saint Anne's College, he was admitted a lawyer in 1850, and for several years was deputy prothonotary of the provincial Superior Court, before becoming clerk of the Circuit and Revision Court. From 1872 to 1891 he was a Liberal member of the House of Commons, prominent in public affairs and notably in a program for a Canadian navy. He was also known for high historical and literary gifts and on three occasions, 1898, 1899 and 1906 was elected president of the Literary and Historical Society of Quebec. Besides numerous contributions to the *Transactions of the Royal Society of Canada* and the *Transactions of the Quebec Literary and Historical Society,* his published writings include: ‹Letellier de Saint Just et son temps› (1885); ‹La fontaine de Champlain à Quebec› (1888); ‹La vie de Joseph-François Perrault› (1898); ‹Les Plaines d'Abraham› (1900); ‹Seconde bataille des Plaines d'Abraham et de Sainte Foye› (1900); ‹La maison de Montcalm› (1902); ‹La maison de Borgia› (1904); ‹Le moulin de Dumont› (1905); ‹Cadet, sa maison et sa résidence à Quebec› (1906); ‹A Few Remarks on Various Gallicisms and French Locutions in the Plays of Shakespeare› (1907); ‹La Chapelle et le tombeau de Champlain› (1907); ‹Notre système judiciaire› (1911).

CASGRAIN, Thomas Chase, Canadian statesman: b. Detroit, 28 July 1852; d. 29 Dec. 1916. He was educated at Quebec Seminary and Laval University, Montreal. He was called to the bar of Quebec in 1877, and was junior council for the Crown at the trial of Louis Riel for high treason at Regina in 1885. He was returned to the provincial assembly of Quebec in the Conservative interest 1886–90, 1892–96, holding office as attorney-general 1891–96. He was chairman of the Royal Commission appointed in 1894 to revise and amend the civil procedure. He represented Montmorency in the House of Commons, 1896–1904. He opposed the Taft-Fielding reciprocity agreement of 1909. He was appointed a member of the International Joint Commission in 1911, and was chairman of the Canadian section, and held the office of Postmaster-General in the Borden administration from 1914 until his death, during which period he represented Quebec County.

CASH REGISTER, an automatic device for recording all transactions handled in retail stores. It is probably the most antique, and yet in its improved form the most modern device known to commerce. More than 6,000 years ago the ancients used a registering device known as the Abacus (q.v.) for the purpose of showing visibly to the buyer and seller the amount purchased.

The modern cash register was invented by Jacob Ritty, of Dayton, Ohio, patented 1879, it being suggested to him by the dial on a steamship which recorded the number of revolutions of the propeller. The first practical cash register was a crude device which punched holes in a strip of paper. By counting the number of holes the merchant could tell how much money he should have in his cash drawer. The present day cash register is a combination adding machine and printing press, which, by its perfect mechanism, provides a record of all transactions handled. It tells instantly how much business each clerk has done; how many customers each clerk has waited on; who, if anyone, has made a mistake; the total amount of money taken in; the number of charge, received on account and paid out transactions handled. It issues a receipt, which bears printed figures of the amount of the transaction, the initial of the clerk who handled it, the consecutive number of the sale, the kind of sale and the date. In addition, this receipt contains the merchant's name and address, together with any advertising he may care to use. Some registers do not issue a receipt, but print the same information on a sales slip inserted in the register. This receipt or slip is wrapped in the package with the goods going to the customer. At the same time the receipt is issued, the miniature printing press prints the detail of every transaction that occurs upon a roll of paper locked up inside the register. This gives the proprietor full information concerning every detail of his business, offering him at a glance facts showing the progress of his store, as well as the industry of each clerk.

The object of the cash register is to stop mistakes, remove temptation, eliminate carelessness, increase trade and increase profits. It furnishes information concerning a business which could be obtained in no other way except through a large amount of detail work. It protects the money received by providing a correct account of all incoming cash, and accounts for the money paid out, and at the same time provides a record of the amount of credit business handled. It not only indicates the amount of each and every transaction, as well as the initial of the clerk who handled it, but at the same time transmits the amount indicated to various sets of adding wheels, and also prints that amount on the receipt going to the customer. A receipt going to the customer bearing printed figures of the transaction makes it necessary to record the correct amount on the register. This ensures the proprietor that he will get an accurate record of every transaction handled in his business. More than 2,000,000 of these machines are in use the world over. See CALCULATING MACHINES.

CASHAN or **KASHAN** or **KASHIN**, Persia, a town in the province of Irak-Ajemee, noted for its production of shawls, silk stuffs and other goods. It is one of the most flourishing towns in Persia, and has a royal palace, numerous mosques, colleges, bazaars and baths. The inhabitants are noted for their industry, and besides shawls and silk stuffs already mentioned, they manufacture copper goods, gold and silver articles, brocade and cottons. They also carry on an active trade in agricultural produce, and carry on commerce with all parts of the Orient and with Europe by way of Ispahan. The silk stuffs produced at Cashan are held in high esteem, and are worn by the Shah and his entourage. Foreigners from the West who have visited the place have found the inhabitants, who belong chiefly to the Shiite sect of Mohammedans, more enlightened and liberal in their treatment of strangers than most Orientals. Many of the merchants are very wealthy, but are compelled by the oppressive exactions of public officials to hide their riches as much as possible from view. The interior of the homes of some of them, which present a neglected aspect on the outside, are said to be palatial in splendor. The province of Irak-Ajemee, in which Cashan is situated, has nearly the same boundaries as the country known to the ancients as Great Media, or Media Proper. It is the most productive portion of Persia, fertile and with a flourishing trade. Cashan has a population of about 30,000. See PERSIA.

CASHEL, Ireland, town in Tipperary County, about 49 miles northeast of Cork; noted as containing the most interesting ruins in Ireland. These consist of a Gothic cathedral founded in 1169; a stone-roofed chapel, built in 1127; Hore Abbey, founded in 1272; the palace of the Munster kings; and a round tower, 80 feet in height and 50 feet in circumference. They are built on the Rock of Cashel, an elevation 300 feet high, and form the summit of the slope which the town occupies. Here was held the great synod, in 1172, when the Irish priests first acknowledged the authority of the English Church and state. Cashel is a Roman Catholic archdiocese. Dean Swift was a native. Pop, 2,813.

CASHEW (a corruption of *acajou*, the French form of the native Brazilian name *acajaiba*), a tree (*Anacardium occidentale*) of the order *Anacardiaceæ*, common in the West Indies. It is a spreading tree, from 20 to 40 feet high, and is a native of the tropics. It has alternate, obtuse, ovate leaves, and bears bunches of red, scented flowers. The juice of the stem is used as a varnish; and an aromatic drug is prepared by decoction and maceration of several parts of the tree, afterward consolidated by evaporation. The nut is small, kidney-shaped, ash-gray, about an inch long, and is seated on the end of a large fleshy receptacle varying in size from that of a cherry to a medium-sized pear. The shell consists of three layers, the outer and inner of which are hard and dry, but the intermediate layer contains a quantity of black, extremely acrid, caustic oil, which is destroyed by roasting the nuts before eating them. The oil is applied to floors in India and elsewhere to protect them from the attacks of white ants. In the West Indies it is put into wine, especially old Madeira, to which, it is said, it imparts an especially agreeable flavor. It is also used in chocolate. A gum with properties similar to those of gum arabic is obtained from the plant.

CASHEW-BIRD, kăsh'ō-bėrd, another name for the galeate curassow. See CURASSOW.

CASHGAR, or **KASHGAR**, Turkestan, the capital city of the Chinese dependency of eastern Turkestan, in the province of Sin-Kiang or Kashgaria. It is situated on the Kizil-Daria or Kashgar River, in a position of strategic importance, 100 miles northwest of Yarkand, and comprises an old and a new town. They are both surrounded by mud walls and moats, and the new town is also defended by a citadel. The latter was built in 1838, is strongly garrisoned and contains the palace of the Chinese governor. There are considerable manufactures of cotton, gold and silver cloths, carpets, etc., and an extensive trade, its position at the junction of several great routes making it the emporium of much of the commerce of central Asia. It was the capital of an independent kingdom till conquered by the Chinese during the 18th century. In 1865 it revolted but was again subdued in 1876–77. The civil government of the region is in charge of a Chinese official, with the rank of Laotai. Pop. about 62,000. Consult Lansdell, 'Chinese Central Asia' (1894); Younghusband, 'The Heart of a Continent' (1904).

CASHIBO, kä-shē'bō, or **CACHIBO**, a savage tribe of Panoan stock living near the Ucayale River, a tributary of the Amazon, in eastern Peru. They are said to eat their old people at death, and have repeatedly killed the white missionaries who attempted to convert them. The men are bearded and wear long skirts. The women go entirely naked until after marriage.

CASHIER, To, in a military sense to dismiss from the service by annulling or withdrawing an officer's commission. It is not an official term in the United States, and is commonly construed among military men as having a more disgraceful significance than «dismissal,» although there is no analogy or precedent in the use of the word by leading English authors to support this construction. Macaulay uses the term in the sense of simple dismissal or annulment of commission. Nevertheless in ordinary military parlance it means dismissal in disgrace. and its use in any other sense is regarded as unjustified.

CASHMERE, or KASHMIR, a principality in the northwest of Hindustan, subject to a Maharajah belonging to the Sikh race, but under British protection and supervision. It is an irregularly shaped mountainous region, noted for its gorgeous scenery and the healthfulness of its climate. It is composed of various provinces or districts, of which Cashmere proper is the most famous and interesting. It is situated in the southwestern portion of the state, and largely consists of an elevated valley intersected by the Jhelum. Besides Cashmere proper, the state embraces the territory of Jamoo, Balti or Iskardo, and Ladakh and Gilghit. The whole principality thus formed is estimated to cover about 84,432 square miles, and its population in 1911 was 3,158,126. It extends from about lat. 32° to 37° N. and from about long. 73° to 80° E. Srinagar is the capital. The territory of Jamoo, which forms the most populous portion of the principality, lies to the north of the Punjab, between the spurs of the Himalaya Mountains leading up to Cashmere and enclosed by the upper courses of the Chenab and Ravee. Its chief town is of the same name. Balti, also called Little Tibet, is an elevated region on the upper Indus, to the north of Kashmir proper, lying to the southwest of the Karakorum Mountains, and having for its capital Iskardo or Skardo. Ladakh, also called Middle Tibet, lies to the southeast of Balti, between the Himalaya and Karakorum Mountains, and is also traversed by the Indus. Its passes form some of the most important media of communication for central Asia. Its capital is Leh on the Indus. Gilghit is a district on the northwest of Balti. Sheep are largely kept by the inhabitants; and the main crops grown are maize, cotton, saffron, tobacco, hops, wheat, barley and beans. Butter is one of the exports. Within recent years great activity has been shown in improving means of communication, but in many parts of the country wheeled traffic is unknown, and there are only a few miles of railway. Educationally it is the most backward part of India, with 98 per cent of illiterates. An independent monarchy until 1586, it was thereafter successively ruled by Moguls, Afghans and Sikhs, and was placed under British protection in 1846. The present Maharajah, Sir Pertab Singh, is a distinguished soldier, and fought in Flanders with the British army in the Great European War.

The language of the people is called Kashmiri and is descended from the Middle Indian vernaculars, and is thus ultimately related to the Sanskrit, although many Arabic and Persian words have been adopted into it. The language has no written literature of native origin, but portions of the Bible have been translated into the vernacular. The script in which it is written is generally Persian; but the older Sharada alphabet, derived from the Devanagari, is sometimes used. Kashmiri folk literature is rich in tales and proverbs, many of which have been published in Knowles' 'Dictionary of Kashmiri Proverbs and Sayings' (London 1885); and 'Folk-Tales from Kashmir' (ib. 1888). Ethnological and anthropological information of value will be found in the following works: Duke, 'Kashmir Handbook' (Leipzig 1903); Pirie, 'Kashmir' (New York 1909); Bruce, 'Kashmir' (ib. 1911); Grierson, 'Manual of the Kashmiri Language, comprising Grammar, Phrase-Book, and Vocabularies' (2 vols., Oxford 1911); Neve, Arthur, 'Thirty Years in Kashmir' (London 1913).

CASHMERE GOAT. See Goat.

CASIGURAN BAY, kä-sē-goo'rän, an inlet on the east coast of the province of Principe, Luzon, Philippine Islands, reached through Casiguran Sound. The sound is about nine miles long from Cape Ildefonso to a narrow passage affording access to the bay. The bay itself is about three-quarters of a mile long and two and a half miles wide. Its depth is some 16 to 26 fathoms.

CASIMIR, kăs-ĭ-mēr, properly **KAZIMIERZ** («founder of peace»), was the name of many Polish princes and kings. (1) Casimir I: b. 1015; d. 1058. During his minority he was under the regency of his mother and was driven from the kingdom with her. In 1041 his power was re-established, and through his efforts the predominance of Christianity was decided in Poland. (2) Casimir II, the Just: b. 1145; d. d. 1194. He was a son of Boleslas III, and ascended the throne in 1179. He pushed his armies into Volhynia and Lithuania and reconquered several places formerly belonging to Poland. He abolished tithes and other illegal imports and in 1180 convened an assembly at Lenczyça, which in time became the Polish Senate. In 1185 he repulsed an attack by the Hungarians and four years later was in conflict with his brother Micislas, who aimed to seize the throne. In 1192 he fought the Prussians. He renewed with the Hungarians the treaty fixing the Carpathians as the boundary between the two nations. (3) Casimir III: b. 1309; d. 5 Nov. 1370, called Casimir the Great, who succeeded his father, Vladislav Loketek, as king of Poland in 1333, was the most distinguished of this name. He added Little Russia and Red Russia to his dominions, and repelled the Tartars, who then threatened Poland. He founded the University of Cracow (1364), as well as several schools and hospitals, and showed great anxiety for the advancement of the arts and of learning in his kingdom. In 1347 he caused a new code of laws to be compiled, and protected the peasants, on which account he was called the peasants' king. He had a Jewish mistress who procured for her nation great liberties and protection. With him the line of the Piasti, which had ruled in Poland for nearly 530 years, became extinct. (4) CASIMIR IV: b. 1427; d. 1492. He was the second son of Ladislaus II Jagiello; was crowned King of Poland in 1447, three years after the death of his elder brother, Ladislaus III, at the battle of Varna. His reign was epoch-making for Poland. The kingdom was threatened from three sides. On the south the Turks were encroaching and aiming to capture Constantinople. On the northeast the Muscovites were beginning to spread and make their weight felt, while on the northwest the Teutonic Knights were ever seeking aggrandizement at the expense of Poland. After 13 years of conflict Casimir finally subdued the Teutonic order and by the Treaty of Thorn (1466) compelled them to cede West Prussia to Poland. Casimir was one of the great statesmen of his age, was possessed of profound political sagacity, great common sense and great patience and moderation. His only subjects gave him more trouble than his powerful enemies from without. The nobles threatened to depose him and from his time onward Poland became more and more an aristocracy. His personal character was marked by extreme simplicity and sobriety. Consult Morfill, 'Poland' (New York 1893); Sokolowski, A., 'Illustrated History of Poland' (Vienna 1904).

CASIMIR-PÉRIER, pā'ryā, **Jean Paul Pierre**, fifth President of the French Republic: b. Paris, 8 Nov. 1847; d. there, 11 March 1907. He was the grandson of Casimir Pierre Périer, famous Premier of Louis Philippe. He entered public life as secretary to his father, A. V. C. Périer, who was Minister of the Interior during the presidency of Thiers. In 1871 he was decorated with the Legion of Honor for bravery in the Franco-Prussian War. In 1874 he became general councillor of the Aube and two years later was sent to the Chambre des Deputés as representative of that department, and was always re-elected until he reached the presidency. He also held under-secretaryships in the departments of Public Instruction and War. Despite the monarchist traditions of his family Casimir-Périer sided with the Republican group of the Left. He refused to vote the expulsion of the princes in 1883, and resigned as deputy when the law was enacted. In 1890–92 he was vice-president and in 1893 president of the chamber. On 3 December of the latter year he became Prime Minister under Carnot and president of the council. He resigned in May 1894 and was re-elected president of the chamber. On 24 June 1894, after the assassination of Carnot, Casimir-Périer was elected, on the first ballot, to the presidency of the republic. He retained the office only six months, surprising the world by resigning on 15 Jan. 1895 and retiring to private life. The reasons impelling him to resign were stated by him to be the restrictions imposed on the President under the constitution. He found himself ignored by his ministers who failed to consult him or even to keep him informed on important questions and business of state. He remained strictly aloof from politics for the remainder of his life, and engaged in mining. At the Dreyfus trial, Casimir-Périer's evidence, as opposed to that of Mercier, greatly aided the cause of the accused officer.

CASINO, ká-sē'nō, or **MONTE CASINO**, a celebrated Benedictine abbey in Italy, in the Neapolitan province of Caserta, near the small town of Cassino and about 45 miles from the city of Naples, founded by Saint Benedict of Norcia in 529 on the site of a temple of Apollo. It was the original home of the Benedictine order. It is situated on a mountain, from which it derives its name, near the ruins of the ancient Casinum, and is approached by a well-paved and winding road. The abbey, after having suffered repeated reverses, finally became considerable for its privileges and its wealth, and in the 11th and 12th centuries was the seat of science, particularly of medicine, the celebrated school of Salerno having been founded by the monks of Monte Casino. The church is very magnificent, although overloaded with ornament, and contains the tomb of the founder. The present buildings were erected from 1637 to 1727. The library and archives contain 50,000 printed books and 30,000 incunabula. The monastery has served as a place of refuge to several sovereigns and pontiffs, and was formerly much visited by pilgrims and travelers, who were entertained free of expense. It is still visited by travelers or tourists, but it is no longer a conventual institution, being enrolled as a national monument in 1866. The railway from Rome now passes near it. Consult Clausse, 'Les origines bénédictines' (Paris 1899); Rickenbach, 'Monte-Cassino von seiner Gründung bis zu seiner höchsten Blüte unter Abt Desiderius' (Einsiedeln 1884–85); Taeggi, 'Paleografia artistica di Montecassino' (Monte Cassino 1876 *et seq.*); Tosti, 'Storia della badia di Montecassino' (Rome 1889–90).

CASINO, a name generally given to a kind of club-house or place of amusement, containing rooms for dancing, playing at billiards, etc. The word is originally Italian, being a diminutive of the Italian word *casa*, signifying a house; and was at first applied to small houses which the nobles of Florence, Venice and other Italian cities often possessed at a distance from their ordinary residences, and which were devoted to purposes of social enjoyment.

CASIRI, kä-sē'rē, **Michael**, orientalist and Syro-Maronite clergyman: b. Tripoli, Syria, 1710; d. Madrid, 12 March 1791. He studied in the College of Saint Peter and San Marcellino; and in 1734 entered the clerical profession. The following year he accompanied the learned Assemanni to Syria, where he was going, at the command of the Pope, to attend the synod of the Maronites, and in 1738 gave, at Rome, an exact account of the religious tenets of the Maronites. He afterward taught in his monastery the Arabic, Syrian and Chaldee languages, theology and philosophy; and in the year 1748 was invited to Madrid, where he was appointed to an office in the royal library. In 1749 he devoted his attention, by the King's orders, to the library of the Escurial, of which he subsequently became the superintendent. Here he collected the materials for his celebrated work, 'Bibliotheca Arabico-Hispana' (2 vols., 1750–70), which enumerates in 1,851 articles the manuscripts of the Escurial library, perhaps the richest in Europe in Arabic manuscripts. This work, though not entirely free from errors, contains very important information and valuable extracts, and is indispensable to every orientalist. In the Madrid National Library are other interesting manuscripts of Casiri, including a copy and Latin translation of an ancient Arabic version of the canons of the Visigothic Church.

CASKETS, The, a group of rocks in the English Channel, seven miles west of Alderney. They have often been fatal to vessels, and, in 1119, Prince William, son of Henry I, and his suite, perished here. In 1744 the *Victory* ship of war, of 110 guns, also was shipwrecked upon them. On the highest there is a lighthouse. Victor Hugo has immortalized them in his ‘Toilers of the Sea.’

CASLER, John Overton, American soldier: b. Frederick County, Va., 1 Dec. 1838. He served in the Confederate army during the Civil War and was a prisoner of war from February to May 1865. He lived in Texas 1877–89, and has since been a resident of Oklahoma City, where he is justice of the peace. He is the commander of the Oklahoma division of United Confederate Veterans, and has published ‘Four Years in the Stonewall Brigade’ (1893); ‘Lilian Stuart, the Heroine of the Rappahannock’ (1889).

CASORIA, ka-so-re'a, Italy, town in the province of Naples (Napoli), six miles north-northeast of Naples. It has four fine churches and is the residence of a district judge. Silk and wine are produced in the neighborhood. Pietro Martino, the painter, was born here. Pop. about 14,000.

CASPARI, käs-pä'rē, **Karl Paul,** German Church historian: b. Dessau, 8 Feb. 1814; d. 11 April 1892. He was born of Jewish parents, and studied in Leipzig and Berlin. He was converted to Christianity in 1838, and subsequently became instructor of theology in the University of Christiania, Norway, in 1847. He became full professor in 1857. His Arabic grammar is in high repute, and his contributions to the study of the Old Testament include works on Obadiah, Isaiah, Micah and Daniel. He published besides the ‘Grammatica Arabica’ (1844–48); the ‘Beiträge zur Einleitung in Jesaga’ (1848); ‘Alte und neue Quellen zur Geschichte des Taufsymbols und der Glaubensregel’ (1879).

CASPE, käs'pā, Spain, town in the province of Saragossa, 12 miles north-northeast of Alcañiz, left bank of the Guadalupe, near its confluence with the Ebro, on several small hills and in the intervening valleys. It has paved streets, one principal and nine smaller squares, a handsome Gothic college and two churches, several chapels, three schools a townhall and prison in a suppressed convent, an hospital and several public fountains. Olive and mulberry trees are extensively cultivated, and coal and iron are mined in the neighborhood. Manufactures — wine, oil and soap. Some trade is also carried on in grain and cattle. A congress of Aragonians, Catalonians and Valencians assembled here in 1412 to settle the royal succession. Pop. 8,427.

CASPER, Wyo., town and county-seat of Natrona County, 150 miles northwest of Cheyenne, on the Platte River, the Chicago, Burlington and Quincy and the Chicago and Northwestern railroads. It contains a Carnegie library, the Wyoming General Hospital, and is the site of Fort Casper. It has extensive interests in live stock, oil and wool. The town owns the waterworks. Pop. 2,700.

CASPIAN GATES, a name given to the Russian fortress Dariel, situated in a narrow defile of the Caucasus, on the Terek, 80 miles north of Tiflis.

CASPIAN SEA, a large lake or inland sea between Europe and Asia, now nearly surrounded by Russian territory but having Persia on the south; 730 miles in length from north to south, and from 130 to 270 in breadth; area about 170,000 square miles; the largest isolated sheet of water on the globe. The water is less salt than that of the ocean, of a bitter taste and of an ochre color, without ebb or flow. In some places it is exceedingly deep, yet it abounds in shallows, so as to prevent the navigation of ships which draw more than 9 or 10 feet of water. The level of the Caspian Sea is considerably lower than that of the ocean. Among the rivers which flow into it are the Volga, Ural, Terek and Kur. In ancient times the Oxus (Amoo Daria) also flowed into it. It has no outlet. The fisheries here, which are very valuable, occupy and train many seamen. Sturgeons and sterlets are caught in great quantities, and there are also salmon-trout, perch, *Silurus glanis*, two kinds of carp and porpoises; seals abound in the upper coasts, and tortoises between the mouths of the Volga and the Ural. In the northern region the first fishing season, called the caviar season, occurs between March and May, when the Volga, Ural, etc., are getting cleared of ice. The second season is in July, when the sturgeon descend the rivers; and the third open-sea fishing goes on from September to November. The only ports at all worthy the name on or near the Caspian are Astrakhan, Baku, Derbend and Astrabad (in Persia). The navigation is at all times difficult and often perilous. Steam packets are now established on this sea. The Russians have also a fleet of war vessels in the Caspian, and a new naval station has been established at Krasnovodsk, on the east side of the sea. By means of river and canal there is water communication between the Caspian and the Black Sea, Baltic and White Sea.

CASS, Lewis, American statesman, diplomatist and soldier: b. Exeter, N. H., 9 Oct. 1782; d. Detroit, Mich., 17 June 1866. In 1800 he removed to Marietta, Ohio, where he entered on the study of the law. He was admitted to the bar in December 1802, and soon after established himself at Zanesville, where he gradually acquired practice. In 1806 he was elected to the Ohio legislature. He served in the first year of the second war with England and in 1813 was appointed governor of Michigan Territory, holding office till July 1831. Michigan at this time had no territorial legislature, and the business of selecting laws for it from the codes of the States devolved on Governor Cass and the territorial judges. Governor Cass was also ex officio superintendent of Indian affairs for the territory, which then included what now constitutes the two States of Michigan and Wisconsin, and this remained for several years the most important part of his duties. Of all this extensive territory, it was only a little tract bordering on Lake Erie and the Detroit River to which the Indian title had not been extinguished. Within the bounds of his Indian superintendency, ultimately made to embrace all the tribes northwest of the Ohio, there were reckoned to be 40,000 Indians, mustering at least 9,000 warriors. The recent hostilities, and the distrust and suspicions of the Indians, occasioned by the constant calls upon them for additional cessions of land, rendered this office one of great delicacy and difficulty. But Governor Cass, while steadily carrying out the policy of acquisition, succeeded also in maintaining the respect, and even in securing the affection of the Indians. In 1817 he obtained, in conjunction with Governor McArthur, a cession of most of the remaining Indian lands within the State of Ohio, with adjoining tracts in Indiana and Michigan, to the extent of 4,000,000 acres in the whole. This cession removed the Indian barrier hitherto intervening between the settlements of Ohio and those of Michigan. In 1819 he met the Chippewas at Saginaw, and obtained a cession of lands in the peninsula of Michigan to the extent of 6,000,000 acres. As yet the northwestern regions were very imperfectly known. At the suggestion of Governor Cass, an expedition, in which he himself bore a conspicuous part, and of which an account has been published by Schoolcraft, was set on foot in 1820, for exploring the northern shore of Lake Superior, and the course of the upper Mississippi. The next year, by a long, circuitous river navigation, he visited Chicago, then nothing but a military post, with a wide wilderness all about it, and there made a treaty with the Chippewas, Ottawas and Potawatamies, by which a large additional tract was obtained, completing the extinction of the Indian title to the peninsula of Michigan south of Grand River. In 1828 he made two treaties, one at Green Bay, the other at Saint Joseph's, by which many millions of acres were credited to the United States. Up to his resignation of the office of governor of Michigan, in July 1831, he had concluded 22 treaties with the Indians, by which cessions had been acquired in Ohio, Indiana, Illinois, Michigan and Wisconsin, to an amount equal to nearly or quite a fourth part of the entire area of those states. When President Jackson reconstructed his Cabinet in August, 1831, Cass was appointed Secretary of War. The policy of the removal of the Indians, especially the southern tribes, to districts west of the Mississippi, had been warmly espoused by General Jackson. The defense of this policy, which had elicited much criticism and a warm opposition, was ably entered upon by Secretary Cass in his first annual report. In 1836 he was appointed Minister to France, a post which he held till 1842. He was on excellent terms with Louis Philippe, of whose character he gave a very friendly and favorable account in his 'King, Court and Government of France,' published in 1840, originally as an article in the *Democratic Review.* By far the most remarkable incident of his diplomatic career occurred just at its close, in his attack on the quintuple treaty for the suppression of the slave trade. He was United States senator (1845–48), and having opposed the Wilmot Proviso, became the Democratic candidate for President in 1848, but was defeated. He returned to the Senate in 1849, and was Secretary of State (1857–60), resigning because President Buchanan would not consent to strengthen the garrison at Fort Sumter. He wrote 'History, Traditions and Languages of the Indians' (1823); 'France, Its King, Court and Government' (1840). See 'Lives' by Schoolcraft (Albany 1848); Smith, W. L. G. (New York 1856); McLaughlin, Andrew C. (Boston 1891); Young, 'Life and Public Service of General Lewis Cass' (Detroit 1852).

CASSABA or KASSABA, kȧs-sä-bȧ, Turkey-in-Asia, town of Manisa Tanjak, 63 miles by rail east of Smyrna. It is noted for the 'melons of Cassaba' which are widely exported, along with cotton, silk and other produce. Pop. 23,000.

CASSAGNAC, käs'sän'yäc', **Bernard Adolphe Granier de,** French journalist and Bonapartist: b. Averon-Bergelle, 11 Aug. 1806; d. Château de Coulommé, 31 Jan. 1880. He studied at Toulouse and then began his career at Paris as contributor of literary criticisms to the *Journal des Débats.* He embraced the cause of Romanticism and his attacks on the conservatism of Racine were the talk of Paris. In 1840 he was sent by the government on a mission to Antilles, where he married a Creole. On returning to France he devoted himself to politics and published a 'Histoire des classes óuvrières et des classes bourgeoises'; a 'Histoire des classes nobles et des classes anobiles,' a 'Monographie de l'église de la Madeleine'; and a romance entitled 'Danaë.' During the revolution of 1848 he left Paris, but returned in 1850 as a Bonapartist. He became editor of the *Pouvoir, Le Réveil, Le Pays.* His entire career was filled with duels, lawsuits, arrests and other sensational indiscretions. After the revolution of 4 September, he left France and published *Le Drapeau* which was sent gratuitously to the prisoners interned in Germany. In 1876 he was chosen deputy by the Anti-Republican party. He defended the Jesuit cause and opposed the creation of departmental normal schools. In addition to the works mentioned above he wrote 'Histoire de la Révolution française' (1850); 'Histoire du Directoire' (1851–56); 'Histoire des Girondins'; 'Histoire populaire de Napoléon III.' His works are not authentic. They are highly colored, superficial but rich in a vigorous journalistic style.

CASSAGNAC, Paul-Adolphe Marie Prosper Granier de, son of Adolphe; had a career and a reputation not dissimilar to those of his father. He was born 2 Dec. 1842; d. at Saint Loir-et-cher, 4 Nov. 1904. He was taken prisoner at Sedan in 1871, and underwent eight months' confinement in Silesia. His violent advocacy of Bonapartism led him into innumerable duels, and he was on several occasions summoned for libelous articles in the *Pays* and other newspapers. He was also a vigorous supporter of General Boulanger. After the death of the Prince Imperial de Cassagnac supported Prince Victor Napoleon. After 1884 he edited a journal known as *L'Autorité.* He wrote a 'Histoire de la troisième République' (1875); 'Empire et royauté'; 'Memoires de Chislehurst'; and in collaboration with his father, 'Histoire populaire abrégée de Napoleon III' (1874–75).

CASSANDER, King of Macedon, son of Antipater: b. about 354 B.C.; d. 297 B.C. He disputed the sovereignty of Macedon with Polysperchon, whom Antipater had appointed regent at his death in 319 B.C. Allying himself with Ptolemy and Antigonus, he conquered Athens; captured Olympias, the mother of Alexander the Great, and put her to death; and connected himself with the royal family by marrying Thessalonica, half-sister to Alexander. He joined, in 315 B.C., the coalition against the growing power of Antigonus; murdered the rightful heir to the throne, Alexander Ægus, and his mother Roxana; and took the title of king in 306 B.C., which was confirmed to him by the decisive battle of Ipsus in 301 B.C. In 297 he was succeeded by his son Philip.

CASSANDRA, also called **ALEXANDRA,** daughter of Priam and Hecuba, and twin-sister of Helenus. Both children, according to tradition, were playing in the vestibule of the temple of the Thymbræan Apollo, not far from Ilium; and having stayed there too late to be carried home, a couch of laurel twigs was prepared for them in the temple. When the nurses went to them the next morning they found two serpents at the side of the children, which, instead of injuring them, harmlessly licked their ears. This miracle produced a still greater one: the hearing of the children was rendered so acute that they could distinguish the voices of the gods. Cassandra subsequently spent much of her time in the temple of Apollo, who, becoming enamored of her charms, disclosed to her all the secrets of the prophetic art, and in return demanded her love. But Cassandra, when her curiosity was satisfied, refused the dishonorable reward. Apollo, incensed at this, solemnly decreed that her prophecies should never find belief. She frequently and continually foretold the destruction of Troy, and warned her countrymen in vain against the deceitful horse. When Troy was conquered, and Cassandra, with the other maidens, fled to the temple of Minerva, Ajax, son of Oïleus, tore her from the altar, deflowered the virgin in the sacred place, and dragged her away to the other female slaves, with her hands tied. On the division of the booty she fell to Agamemnon, who carried her as his slave and mistress to Mycenæ. Clytæmnestra murdered them both. Agamemnon had twins by her — Teledamus and Pelops, who were put to death by Ægisthus. The ancients regarded this rape of Cassandra as a most infamous atrocity. It has often afforded a subject to poets and sculptors. The Locrians, the countrymen of Ajax, were afflicted on this account for many years with storms, and their country was desolated with the plague. Æschylus tells her story in the ‹Agamemnon.›

CASSANDRA, the most westerly of the three tongues of the Chalcidic peninsula, between the gulfs of Salonica and Cassandra. Its ancient name was Pallene. The Gulf of Cassandra was anciently Toronaicus Sinus.

CASSANO D'ADDA, käs-sä'nō däd'dä, Italy, town in the province of Milan, and 16 miles north-northeast of the town of Milan, pleasantly situated on a hill on the right bank of the Adda. It is very old, and built mostly of bricks. A bridge of 800 paces connects it with the opposite bank of the river. There are numerous silk-mills. Its military position on the right bank of the Adda has caused it to be the scene of several battles. Here Ezzelino da Romano, the leader of the Ghibellines in Italy, in the time of the Emperor Frederick II, was defeated in 1259; here also Prince Eugene was defeated in 1705, by the Duc de Vendôme, and the French under Moreau, by Suvaroff in 1799. Pop. of commune 9,150.

CASSAREEP, kăs'sạ-rēp, **CASSIREEPE,** or **CASSIRIPE,** the concentrated juice of the roots of the common or bitter cassava (*Manihot utilissima*), flavored by aromatics, and deprived of its poisonous properties by boiling. It is used to give a relish to soups and other dishes, and forms the basis of the West Indian «pepperpot.»

CASSAS, kăs-sä, **Louis François,** French landscape-painter and architect: b. Azay-le-Féron, 3 April 1756; d. Versailles, 2 Nov. 1827. A pupil of Jean-Jacques Lagrenée, he journeyed in Italy and in the Levant. On his return he was appointed inspector and professor of design at the Gobelins in Paris. From the materials collected in his travels have been compiled ‹Voyage pittoresque de la Syrie, de la Phénicie de la Palestine, et de la Basse Egypte› (30 vols., Paris 1799), and ‹Voyage historique et pittoresque de l'Istrie et de la Dalmatie› (1802, with 69 copper plates). The original drawings for both works were oil paintings, and they were deposited in the Bibliothèque Royale. His ‹Galerie d'architecture des différentes peuples,› a collection of models of restorations of ancient architecture, has been placed in the Ecole des Beaux Arts in Paris.

CASSATION, a term used in the courts on the continent of Europe. It is derived from the Middle Ages, and signifies the annulling of any act or decision if the forms prescribed by law have been neglected, or if anything is contained in it contrary to law.

CASSATION, Court of (*Cour de Cassation*), one of the most important institutions of modern France, which gives to the whole jurisdiction of that country coherency and uniformity without endangering the necessary independence of the courts. It was established by the first National Assembly, and has been preserved in every essential respect, under all the changes of the Revolution and Restoration. It has been maintained even in those districts which, by their union with France, became subjected to French laws, but by the Peace of Paris again became part of the Prussian monarchy. In France, as early as the reign of Louis IX (1226–70), though a separate court of justice had come into being, petitions were presented to the King by appellants from the decisions of the courts. In later times appeals to the parliaments, as the highest courts of the kingdom, came into use, and their decisions were not liable to be set aside by the ordinary forms of law. Yet the parties were allowed to dispute even these decisions if they were founded upon errors of fact or violated undisputed principles of law; and by an ordinance of 1302 it was provided that the parties should be allowed royal letters for the defense of their rights against the decisions of the Supreme Courts (*lettres de grâce de dire contre les arrêts*), which should be issued from the chancery (by the chancellor of France). The case was then sent back to the Parliament for further investigation, but was examined and decided in the presence of the king himself, or of a special commissioner. An abuse, however, crept in of transferring these cases to the royal council, where they were decided by officers called *maîtres des requêtes.* These letters received the name of *lettres de proposition d'erreur,* and during the civil commotions at the end of the 14th century began to be more frequently presented to the council, which, as soon as one party complained of the partiality of the parliaments, transferred the case to its own bar, and obstructed the course of justice by *lettres d'état,* suspensions of the process, on the pretext of the absence of one of the parties in the service of the king. Under the Chancellor Poyet (1538-42), this abuse reached its highest pitch; but the Chancellors Olivier (1545-51) and Hôpital (1560-68), the two great reformers of French jurisprudence, limited the use of these *lettres* till, by the Ordinance of Blois (1576), all the provisions against the decisions of the parliaments were reduced to these three:— the *proposition d'erreur,* for an error of fact; *requête civile,* to restore the parties to their former condition on account of the fraud of one of the parties or the mistakes of the attorney; and *cassation* (petition for abrogation), for violation of forms or settled principles of law. By the famous Order of Procedure of 1667 the first of these provisions was abolished, but the province of the *requête civile* and *cassation* was enlarged and more precisely defined. The former was always brought before the court itself and decided there, the latter before the council. For this purpose, in the *conseil privé,* or *conseil des parties,* a particular committee was formed, consisting of the chancellor, the four Secretaries of State (Ministers of the Departments), the Council of State, and all the *maîtres des requêtes* (in 1789, 78 in number). The decisions of this committee were too much influenced by the will of the king and the ministers, and by various other circumstances, so that they did not enjoy great respect, though they often exposed acts of great injustice on the part of the Parliament and other high courts. It was therefore abolished in the first National Assembly, and its place supplied by an independent court — the *tribunal de cassation* (decrees of 27 Nov. and 1 Dec. 1790), which was retained in all the constitutions and received under the Imperial government (1804) the name *cour de cassation,* which it still retains. It consisted, according to the organization of 1800, of 48 members, chosen from the Senate, on the nomination of the consuls, who elected their own president from among themselves. The appointment of president was afterward vested in the emperor. In the *Charte Constitutionelle* of 1814 the number of members of the *Cour de Cassation* was fixed at 49, at which it still remains. The members are appointed for life by the President of the Republic, and consist of a first president, three presidents of sections, and 45 councillors, a public prosecutor, the procureur-général and 6 substitutes, the avocats-généraux. The Minister of Justice, or Keeper of the Seals (*garde des sceaux*) has the right of presiding on certain occasions. This court never decides on the main question at issue, but on the competency of the other courts and on the petitions to have their decisions reviewed or annulled, and assigns the question to another court if a decision is to be set aside for an evident violation of the forms or the principles of the law. For this purpose it is divided into three sections or chambers:— the *chambre des requêtes,* which decides on the admissibility of the petitions in civil cases; the *chambre de cassation civile;* and the *chambre de cassation criminelle.* After a decision has been reversed, if a second court decides the same case in the same way, and an appeal is entered again, the Court of Cassation must either request an authentic explanation of the law from the government, or at least all the three sections must unite, to pronounce a second reversal or cassation; and if a third decision is the same as the preceding, the court before which the case is again brought must submit to the doctrine of the Court of Cassation on the point of law in dispute. This system, which dates from 2 April 1837, gives great authority to this court in matters of jurisprudence. According to the law in force before 1837, the court before which a case was brought for decision a third time was not required to adopt the views of the Court of Cassation, but after the third decision there was no further appeal. The government, however, in that case gave an authentic interpretation of the law if there was any occasion for so doing. Until the end of 1852 there was a similar Court of Cassation for the Prussian province of the Rhine, but in 1853 its jurisdiction was transferred to the supreme Prussian tribunal sitting at Berlin. The sentences of the Court of Cassation are not only recorded in the journals of the courts, the decisions of which are reversed, but published likewise in an official bulletin, by which consistency and uniformity are preserved. The tribunal of cassation has enjoyed from its commencement the respect and confidence of France, and has numbered among its members several of the most distinguished lawyers; as the President Henrion de Fansey, the councillors, Chabot, Merlin and Carnot. The court possesses disciplinary powers over the judges of other courts, and the procureur-général over other procureur-généraux. See APPEAL; COURT.

CASSATT, Alexander Johnston, American railway president: b. Pittsburgh, Pa., 8 Dec. 1839; d. Philadelphia, Pa., 28 Dec. 1906. He was educated in the University of Heidelberg, and the Rensselaer Institute, Troy, N. Y., and in 1859 was employed as civil engineer in surveying a railroad route in Georgia. He entered the service of the Pennsylvania Railroad as rodman in 1861, became general superintendent of the Pennsylvania system and general manager of the lines east of Pittsburgh, 1871-74; third vice-president, 1874; and first vice-president, 1880. He resigned this last-named post in 1882, but was elected a director in 1883, and in June 1899 was elected president of the Pennsylvania system and was the successful procurer of the terminal for this railroad in New York city. He was president of seven companies, and a director in 23, including transportation, banks and trust companies.

CASSATT, Mary, American artist: b. Pittsburgh, Pa., about 1855. In 1875 she went to Europe to study art, and lived for some years in Spain, where she gave particular attention to the works of Velasquez. Removing to Paris, she was influenced by the work of Manet and Legas, and exhibited in the Impressionist Exposition about 1880. In 1898 she exhibited some of her works in New York city. Returning to Europe, she established a studio in Paris, where she has since lived. She has gained considerable fame as an etcher, ranking among the first of the modern artists in this medium. Her subjects are almost invariably women and children, particularly mother and child, in the environment of home. The children, especially, are depicted with truth, originality and a remarkable power of observation, but without prettiness. Among her best-known paintings are 'The Bath'; 'Breakfast in Bed'; 'Mother's Caress'; 'In the Garden'; 'At the Mirror'; 'Maternity'; 'Child Playing with a Dog'; 'Child's Toilet'; 'In the Box.' Miss Cassatt is represented in the Luxembourg by 'The Young Mother,' a pastel; in the Metropolitan Museum, New York, by 'Mother and Child,' and in the museums of Boston and Worcester by similar subjects. She is also known for her tinted etchings, the best known of which is a series of 10 entitled Maternity.

CASSAVA, kăs-sä'vą, **MANIOC,** măn'ĭ-ŏk, or **MANDIOC,** a South American shrub (*Manihot utilissima*) belonging to the natural order *Euphorbiaceæ*, sub-order *Crotoneæ*. There are two forms, popularly known as bitter and sweet, both of which are widely cultivated in tropical America for their fleshy, cylindrical, starchy roots, which form a large part of the food of the natives, and from which tapioca is made. They have also been introduced into other warm countries, especially Africa, and have quickly gained important positions as food crops.

The plant, which attains a height and breadth of four feet or more, is rather bushy, since its numerous knotty, brittle, pithy stems have many palmate leaves. The flowers, which appear in midsummer, are green or yellowish and inconspicuous and are succeeded by wing-angled capsules. The best results are obtained on light, sandy, well-drained soils. The land is prepared as for corn, but instead of planting seed, stem cuttings are covered by the plow, and when the plants appear they are cultivated with the same implements used in corn-growing. In about seven months the white soft roots, which occasionally weigh 30 pounds, and are sometimes three feet long and three inches thick, are dug by hand, washed, grated or ground to pulp. The juice, or poisonous part, is carefully pressed out, and when boiled, becomes the delicious sauce called casareep (q.v.), much esteemed by epicures. The flour that remains after pressure is formed into thin, round cakes and baked. To a European accustomed to eat bread, these, though sweetish and not unpalatable, have an insipid taste. If placed on close vessels, and preserved from the attacks of insects, cassava bread may be kept for several months without injury.

Poisoning by the bitter cassava is due to the presence of minute quantities of hydrocyanic acid (q.v.). This is a very common ingredient of many fruits and seeds, but usually is modified as the fruit ripens. The general process of manufacture of cassava destroys or drives off the free hydrocyanic acid.

The natives of South America throw a number of cakes of cassava together to heat, after which they soak them in water, which causes a rapid fermentation to take place; and from the liquor thus obtained they make a very sharp and disagreeable, but intoxicating, beverage, which will not keep longer than 24 hours without spoiling.

From the pure flour of cassava is formed the substance called tapioca, which is frequently used for jelly, puddings and other culinary purposes. This is separated from the fibrous parts of the roots by taking a small quantity of the pulp after the juice is extracted and working it in the hand till a thick, white cream appears on the surface. This, being scraped off and washed in water, gradually subsides to the bottom. After the water is poured off the remaining moisture is dissipated by a slow fire, the substance being constantly stirred, until at length it forms into grains about the size of sago. These become hard by keeping, and are the purest and most wholesome part of the cassava. The starch of cassava, separated from the fibre by the usual processes, is known as Brazilian arrowroot.

The roots of another species of this shrub, called sweet cassava (*Manihot aipi*), the juice of which is not poisonous, are usually eaten with butter, after being roasted in hot ashes. They have much the flavor of chestnuts, and are an agreeable and nutritive food, containing about 30 per cent of carbohydrate materials. The roots of the sweet cassava are also used as stock-food and to make glucose and starch. Florida is the only State in which sweet cassava has attracted much attention, but it seems to be not very profitable there on account of the high price of labor and fertilizers. Consult United States Department of Agriculture, Bureau of Chemistry, Bulletins 44 (1894), 106 (1907), and Farmer's Bulletin 167 (1903).

CASSEGRAINIAN TELESCOPE, a form of the reflecting-telescope in which the great speculum is perforated like the Gregorian, but the rays converging from the surface of the mirror are reflected back by a small convex mirror in the axis of the telescope, and come to a focus at a point near the aperture in the speculum, where they form an inverted image, which is viewed by the eyepiece screwed into the tube behind the speculum. In use this telescope thus possesses the convenience that the observer looks directly through the tube at the object to be examined, exactly as in using the more usual refracting telescope. Moreover, as in all reflecting telescopes, the light, as it is merely reflected, is not separated into its component colors, as is the case when it passes through a lens. For this reason reflecting telescopes are widely used in certain branches of astronomy, especially in spectroscopic and photographic work. In particular, an enormous Cassegrainian telescope has been completed (1916), for use in the new Dominion Astronomical Observatory at Victoria, Canada. The mounting of this instrument is by Warner and Swasey of Cleveland, Ohio; the great 72-inch mirror was figured by the John A. Brashear Company of Pittsburgh.

CASSEL, käs'sĕl, or **KASSEL,** formerly the residence of the Elector of Hesse-Cassel, and now the chief town in the Prussian province of Hesse-Nassau, lies on the Fulda, 35 miles southwest of Göttingen and 91 miles north-northeast of Frankfort-on-the-Main. It is divided into the Altstadt, or Old Town; the

Ober Neustadt, or Upper New Town; the Unter Neustadt, or Lower New Town; and the new West Quarter; all but the third being on the left bank of the river. Cassel has several fine squares, or open areas, on the principal of which, the Friedrichsplatz, stands the electoral palace, an indifferent structure; and next to it the museum, a handsome building, containing a library of 235,000 volumes, and many valuable MSS, including the Hildebrandslied dating from the 8th century. The brothers Grimm were librarians here from 1814 to 1830. The Murhard Public Library contains 155,000 volumes. At one end of this area is a handsome triumphal arch and war monument overlooking the Fulda Valley, in which is the Karlsaue, finely laid out, and forming a favorite promenade. On this side of the city are also the building for the courts and government officers, the Bellevue palace containing the academy of arts, and the handsome picture gallery containing some fine examples of the old masters, especially the Flemish and Dutch. The other more noticeable public areas are the Königsplatz, in the form of a circle; the Friedrich-Wilhelmsplatz, with an ornamental fountain; the Ständeplatz, a broad tree-planted avenue, etc. The most noteworthy church is the Protestant church of Saint Martin, with a nave of the 14th and a choir of the 15th century. An observatory is likewise situated here. Cassel is the seat of the provincial and district government and of the supreme provincial court. The town's affairs are administered by a municipal council of 48 and an executive board of 21 members. There is a modern sewage system and a copious water supply, and the town owns and operates gasworks, an electric-light plant and a slaughter house. There are numerous educational institutions, including two gymnasia, three municipal high schools and a score of technical schools. There are many hospitals and other charitable institutions. Cassel has excellent railway facilities, and two electric street-railway lines accommodate the city traffic. It is the seat of a United States consulate. Cassel has iron-foundries and machine-shops, works for railway-carriages, mathematical instruments, pianos, gloves, jute works, etc. The town dates from the year 913, when, under the name of Chassala, it was the residence of King Conrad I. It received its first municipal rights in the 13th century from the landgraves of Thuringia. In the Seven Years' War it was several times captured by the French. Landgrave Frederick II sent 12,000 Hessians to aid the British in the American Revolution and was paid $22,000,000. In 1807 it was made the capital of the newly-formed kingdom of Westphalia. In 1866 it was occupied by Prussian troops and became a part of Prussia. In the vicinity is Wilhelmshöhe, the ex-elector's summer palace the temporary residence of Napoleon III after Sedan. Pop. about 107,000.

CASSELS, Sir **Walter** (Gibson Pringle), Canadian judge: b. Quebec city, 14 Aug. 1845. He was educated at the high school, Quebec, and Toronto University, and graduated B.A. in 1865. He was admitted a barrister in 1869, became one of the leaders of the Ontario bar, and held briefs in many important causes. He was appointed a judge of the Exchequer Court of Canada in 1908, and was knighted in 1917.

CASSIA, a genus of leguminous plants, of the family *Cæsalpiniaceæ*, inhabiting the tropical parts of the world, consisting of trees, shrubs or herbs, the leaflets of several species of which constitute the well-known drug called senna. That imported from Alexandria is obtained from *C. acutifolia*. *C. fistula* is found wild in India. Its legumes contain a quantity of thick pulp, which is a mild laxative and cathartic, and enters into the composition of the confection of cassia and the confection of senna. It belongs to the sugar class of laxatives, its properties being due for the most part to the water-attracting properties of sugar while in the intestinal canal. The leaves and flowers are also purgative. The bark and roots of several of the Indian species are much used in medicine. «Cassia bark» is a common name for the bark of an entirely different plant, *Cinnamomum cassia*, belonging to the laurel family. It is much imported into Europe, mostly from China, and is also called «*Cassia lignea*.» Its flavor somewhat resembles that of cinnamon, and as it is cheaper it is often substituted for it, but more particularly for the preparation of what is called oil of cinnamon. The cassia of the Bible was probably cassia bark. Cassia buds, which are similar in flavor, are the unripened fruits of this tree.

CASSIANUS, otherwise called Joannes Massiliensis and Joannes Eremita, early theological writer and zealous advocate of the monastic system: b. about 360, probably in Provence; d. Marseilles about 435. It is certain however, that he traveled extensively in the East, spent a few years in Bethlehem, traveled to Egypt and seems to have visited the hermits in the desert. He was deeply attached to Saint Chrysostom and when the latter, through the intrigues of his opponents, was removed from the episcopal chair, Cassianus was sent with Germanus to Rome to present a memorial from the clergy who adhered to Chrysostom. Here he became personally acquainted with Pelagius. About 415 he went to Marseilles, where he continued a course of restless activity as a presbyter till his death. He founded a monastery and a convent on the principles laid down by him in his works 'De Institutis Cœnobiorum' and 'Collationes Patrum Sceticorum' (that is, 'Conferences of the Fathers in the Desert of Sketis'). The views advanced in these works, and still more the strong leaning which he showed to the dogmas of Pelagius, involved him in a controversy with Augustine. He ultimately modified his opinions so far as to adopt the system to which theologians have given the name of Semipelagianism, holding that man, since the fall, is not absolutely incapable of good, but, on the contrary, both derives from nature the seeds of virtue, and is able of himself to commence their primary development, though he requires the aid of divine grace to bring them to maturity. These views found great favor with the monks of France, and long maintained their ground in opposition to the efforts of Augustine and his friend Prosper of Aquitania. At the desire of Leo, then Pope, he wrote against Nestorius his 'De incarnatione Domini' in seven volumes. The best edition of the works of Cassianus is that of Frankfort (1722, fol.). They are found in the English translation by E. C. S. Gibson in volume IX of 'Nicene and

Post-Nicene Fathers' (2d series, London and New York 1884). Consult Harnack, A., 'History of Dogma' (Vol. V, pp. 246ff., 253ff.); Moeller, W., 'History of the Christian Church' (Vol. 1, pp. 368–70).

CASSIN, John, American ornithologist: b. near Chester, Pa., 6 Sept. 1813; d. Philadelphia, 10 Jan. 1869. He resided in Philadelphia from 1834, and excepting a few years partially given to mercantile pursuits, devoted himself to the study of ornithology. He contributed descriptions of new species and synoptical reviews of various families to the 'Proceedings' and the 'Journal' of the Philadelphia Academy of Natural Science; and his more elaborate publications are 'Birds of California and Texas' (1862), containing descriptions and colored engravings of 50 species not given by Audubon; 'Mammalogy and Ornithology of the Wilkes Exploring Expedition' (1858); 'Ornithology of the Japan Expedition'; 'Ornithology of Gilliss's Astronomical Expedition to Chile'; and the chapters on rapacious and wading birds in the 'Ornithology of the Pacific Railroad Explorations and Surveys' (Washington 1858); 'The Birds of North America' (1860). His works are the result of careful research, and are especially valuable for their descriptions and classification of many birds not given in the previous works of Wilson and Audubon. According to Coues he was the only American ornithologist as familiar with the birds of the Old World as with those of America.

CASSINI, kas-sē'nē, **Arthur Pavlovitch,** Russian diplomat: b. 1835. He began his public career in 1855, being attached to the Department of Foreign Affairs. He held various minor diplomatic offices in Europe and in 1891 became Minister at Peking, during the war with China and Japan successfully advancing Russian interests. He became Minister at Washington in 1897 and later the first Russian Ambassador to the United States. In 1905 he went as ambassador to Madrid and represented Russia at the Algeciras conference.

CASSINI, Giovanni Domenico, Italian astronomer: b. Perinaldo, near Nice, 8 June 1625; d. Paris, 14 Sept. 1712. He studied at Genoa with the Jesuits. Chance turned his attention to astronomy, in which he made such rapid progress that in 1650 the senate of Bologna bestowed on him the first professorship of astronomy at the university. He worked out more correct tables of the sun and a more precise determination of its parallax. By an observation at Città della Piave he discovered the shadows cast by the satellites of Jupiter on the disc of that planet when they are between it and the sun. By means of these he corrected his theory of the motion of the satellites; he also determined the period of Jupiter's revolution. In 1668 he published his 'Ephemerides of the Satellites of Jupiter.' In 1671 he became director of the observatory at Paris and in 1673 became naturalized as a French subject. He discovered four new satellites of Saturn and the zodiacal light; proved that the axis of the moon is not perpendicular to the plane of the ecliptic, and showed the causes of her libration. The laws of this motion are one of his finest discoveries. He also wrote observations on the Indian calendar. He believed that the planetary orbits were not ellipses, but members of a family of curves called after him Cassinian ovals (q.v.). The meridian commenced by Picard and Lahire was continued by Cassini in 1700 to the extreme limits of Roussillon, and when measured 100 years later showed a difference of only 21 toises (about 134 feet). His 'Opera Astronomica' was published at Rome in 1666.

CASSINI, Jacques, French astronomer: b. Paris, 18 Feb. 1677; d. Thury, department of Oise, 16 April 1756. He was the son of Giovanni Domenico Cassini and succeeded him in his post at the Paris observatory. In 1694 he was admitted into the Academy of Sciences. His labors to determine the figure of the earth are well known. The first measurement of 1718 made the degrees of the meridian shorter toward the north than toward the south, whence it was concluded that the earth was an oblate spheroid. Cassini continued the measurement, and maintained this opinion in his work 'De la grandeur et de la figure de la terre.' In order to settle the question the Academy was commissioned in 1733 to measure the whole length of France from Brest to Strassburg. Cassini directed this undertaking, but was led into some errors by the defective instruments of former observers. The astronomical tables which he compiled were published at Paris in 1740. He compiled the first tables on the inclinations of the orbits of Saturn's satellites and ring. In addition to his astronomical works, he wrote several essays on subjects in natural philosophy, etc.

CASSINI, Jacques Dominique, Comte de, French astronomer: b. Paris, 30 June 1748; d. Paris (?), 18 Oct. 1845. He was the son of Cassini de Thury and succeeded his father in 1784 as director of the Paris observatory. He was a member of the Academy, and a statesman of ability as well as a mathematician. In 1789 he completed the topographical work which was begun by his father. The 'Atlas National' was a reduction of it on a scale of one-third. Cassini was arrested by order of the revolutionary tribunal. He escaped with life, but lost the copper-plates of the 'Carte de France,' which had cost 500,000 francs. Napoleon made him a count of the empire.

CASSINI DE THURY, tü-rē, **César François,** French astronomer: b. Paris, 17 June 1714; d. 4 Sept. 1784; son of Jacques Cassini. He was a member of the Academy from his 22d year, and director of the observatory in 1756. He undertook a geometrical survey of the whole of France in 1744. When the support of the government was withdrawn in 1756, Cassini formed a society for advancing the requisite sums, which were to be repaid by the sale of the maps constructed from the survey. The work was almost entirely finished when he died.

CASSINIAN, or CASSIAN OVAL, the locus of a point the product of whose distances from two fixed points is constant. It varies in shape as the constant product and the distance between the fixed points are differently chosen, and may break up into two separate but symmetrical figures. A special form is that of Bernouilli's lemniscate. Its general Cartesian equation referred to its axes of symmetry is

$$(x^2 + y^2 + a^2)^2 - 4a^2 x^2 + a^4 = m^4,$$

and the corresponding polar equation is

$$r^4 - 2a^2 r^2 \cos 2\vartheta + a^4 = m^4.$$

See Briot et Bouquet, 'Géometrie analytique' (4th ed., Paris 1890; tr. Chicago 1896).

CASSINO, Italy, until 1871 known as SAN GERMANO, city of Caserta province, on the Rapido, 85 miles southeast of Rome. Of great historic interest, and the seat of the celebrated monastery of Monte Cassino, nearby are interesting ruins of the village of M. Terentius Varro where, according to Cicero, Antony led a dissipated life, also a ruined amphitheatre built by Ummidia Quadratilla, a Roman lady of whom Pliny writes in his letters. Popes and emperors resided at San Germano and here Frederick II and Gregory IX effected a peace in 1230. It was the scene of an Austrian victory over Murat 16 March 1815. Pop. 14,220.

CASSINO, a game at cards usually played by four persons (although more can enter the game), two on each side. In it the ten of diamonds, technically called big cassino, counts two; and little cassino, the two of spades, counts one. The points possible to be scored in one deal (exclusive of sweeps) number 9. They are: Big cassino, 2; little cassino, 1; cards, 1; spades, 1; each ace, 1=4. A sweep is counted when a player takes up all the cards on the table. The object sought in the game (besides the points already enumerated) is to arrange the cards on the board in combination so that the sum of the spots on the cards thus combined may equal those on one card in the hand of the player, who has the right to take as many cards from the board as he can thus combine; or he may capture any card from the board the counterpart of which he has in hand. This can be done also by playing cards from the hand in such a manner that the sum of the spots on these cards and on cards on the board equals that on a card in the player's hand.

CASSIODORUS, Flavius Magnus Aurelius, Roman historian and statesman, who lived from about 468 to 568. He entered the service of the Ostrogoth king of Italy, Odoacer, at the age of about 20 years and under him and his successor, Theodoric, was treasurer of the kingdom and councillor, administering his office with extraordinary prudence in a most difficult time. As statesman, scholar and historian he kept alive the lamp of the Græco-Roman learning after the overwhelming of the ancient civilization by the barbarians. After a term of 50 years in public station he withdrew to a monastic institution founded by himself in his native province, Bruttium, and there spent the remaining 30 years of his useful life, imbuing his monks with a love of the ancient learning and employing them in copying the ancient texts of profane no less than of religious writings. He may be regarded as the father of the monastic *Scriptorium* to which modern learning is indebted for a great part of what has come down to us of the ancient literature and of the history of the West in those troublous times. He composed manuals of rhetoric and grammar which were used as textbooks in the schools of the Middle Ages till the revival of the ancient learning, which inspired men with a longing for the ancient knowledge. Of great service also were his works 'De Artibus ac Disciplinis Liberalium Litterarum' (of the liberal arts and courses of study), and his 'De Institutione Divinarum Litterarum' (instruction in scriptural knowledge); but above all his 12 books of 'Epistolæ Variæ' (various letters), containing decrees of the Ostrogothic kings, upon which is based the whole history of Italy under the rule of those barbarian potentates. This collection was first printed at Augsburg 1533. With one Epiphanius he made a compendious Latin version, entitled 'Tripartita Historia' (tripartite history) of the history of the Church as written by the three Greek historians, Socrates, Sozomen and Theodoret, and continued Socrates' history to the year 518. An edition of his complete works was printed at Rouen in 1679 and at Venice in 1729. His 'Life' was written by the eminent Benedictine, Sainte Marthe, and published in Paris in 1694. His works are published in Migne, 'Patrologia Latina' (Vol. LXIX). Consult Sandys, 'A History of Classical Scholarship' (Vol. I, especially pp. 258–270, Cambridge 1906).

CASSIOPEIA, kăs-ĭ-ō-pē'yạ, in Greek mythology, daughter of Arabus and wife of Cepheus, King of Ethiopia, to whom she bore Andromeda. She dared to compare her own beauty to that of the Nereids, who, enraged thereat, besought Poseidon for vengeance. The god, in compliance with the request of the water-nymphs, laid waste the dominions of Cepheus by means of a deluge and a dreadful sea-monster.

In astronomy Cassiopeia is a conspicuous constellation in the northern hemisphere, situated next to Cepheus. In 1572 a new and brilliant star appeared in it, which, however, after a short time, gradually diminished; and has been identified by Hinal and Plummer with a reddish, 11th-magnitude variable which is still visible. The five brightest stars in the constellation of Cassiopeia are arranged in the form of a straggling W, which is easily recognized.

CASSIQUIARI, käs-sē-kē-ä'rē, or **CASSIQUIARE,** a deep rapid river of South America, in Venezuela, branching off from the Orinoco, and forming a water-way by which that river has navigable communication with the Rio Negro. It leaves the Orinoco in lat. 3° 10′ N.; long. 66° 20′ W., about 20 miles west of Esmeralda, and, after a southwest course of 128 miles falls into the Rio Negro near San Carlos, in lat. 2° 5′ N.; long. 67° 40′ W. It is estimated to carry off about a third of the water of the Orinoco, being 100 yards broad where it leaves that river, and about 600 yards at its junction with the Rio Negro. By means of this river, the Rio Negro, the Amazon and its tributaries, it is practicable to sail from the interior of Brazil to the mouth of the Orinoco.

CASSITERIDES, kăs-sĭ-tĕr'ĭ-dēz, a name derived from the Greek *kassiteros*, tin, and anciently applied, but with no uniformity or precision, to the tin district of Cornwall, to the Scilly Isles or to small islands off the northwest coast of Spain.

CASSITERITE, native dioxide of tin, SnO_2, crystallizing in the tetragonal system, and also occurring uniform and in rolled grains. The crystals are usually brown or black, brittle with an uneven fracture, and with a specific gravity of from 6.8 to 7.1, and a hardness of from 6 to 7. Ordinary massive or crystallized cassiterite is often called «tinstone,» especially in England; «wood tin» is a botryoidal form; «stream tin» is the mineral in small rolled pebbles found in the streams or placer deposits and is formed by the disintegration of stanniferous rocks. Cassiterite is the most important ore of tin. It occurs in Cornwall (England), Saxony, Bohemia, Galicia, Greenland, Sweden and in Australia, the Malay Peninsula, Banca, Bolivia and Mexico. In the United States it is found in small amounts in various States, and it has been mined to some extent in Virginia, in South Dakota and in San Bernardino County, Cal.

CASSIUS, kăsh'ŭs, **Andreas**, German physician who was born in the first half of the 17th century at Schleswig; d. Hamburg 1673. He was graduated at Leyden in 1632, was physician to the Duke of Holstein and bishop of Lübeck, and practised at Hamburg. His name is best known in connection with a purple color obtained from gold, which was briefly described in a treatise published by his son in 1685.

CASSIUS, Purple of. See PURPLE OF CASSIUS.

CASSIUS LONGINUS, Gaius, the friend of Brutus, was the quæstor of Crassus, and preserved the few troops of that general who escaped from the bloody battle with the Parthians. With these he defended Syria against the Parthians till the arrival of Bibulus. In the famous civil war that broke out between Pompey and Cæsar he espoused the cause of the former, and, as commander of his naval forces, rendered him important services. When Cæsar, after the victory of Pharsalia, was in pursuit of Pompey, he advanced with a few vessels, while crossing the Hellespont, against a fleet of 70 sail commanded by Cassius, and called upon him to surrender. The latter, astonished by his daring courage, surrendered at his summons. Cæsar pardoned him, and afterward bestowed various honors on him; but Cassius, who had always cherished feelings of bitter hatred toward Cæsar, joined in the conspiracy against him, and, with the aid of several fellow-conspirators, assassinated him, 44 B.C. He then, together with Brutus, raised an army to maintain the cause of their faction. They were met by Octavianus and Antony, who professed themselves the avengers of Cæsar, at Philippi. The wing which Cassius commanded being defeated, he imagined that all was lost, and killed himself, 42 B.C.

The name is also applied to a Roman jurist who flourished about 3–75 A.D., consul in 30, proconsul of Asia (45–50). After serving as governor of Syria, he was banished for his loyalty to the memory of Cassius, the murderer of Cæsar. In the reign of Vespasian, he was recalled. His book, 'Libri Juris Civilis' was used by Justinian in his codification. See BRUTUS; CÆSAR.

CASSIVELLAUNUS, kăs-ĭ-vĕ-lô'nŭs (in Shakespeare's 'Cymbeline,' CASSIBELAN), a noble and warlike British chief of the Catuvellauni, who, when Cæsar invaded Britain in 54 B.C., held sway over several tribes living to the north of the Thames, and led the resistance to the advance of the Roman general. Having advanced to the Thames, Cæsar found the Britons under Cassivellaunus posted on the north bank of the river prepared to dispute his passage. He crossed, however, without much difficulty, but the British charioteers persistently harassed his line of march. The Trinobantes, a tribe of Essex and Middlesex, soon sent in their submission to Cæsar, and as their example was followed by others, Cassivellaunus found himself unable to oppose resistance to the Romans. His stronghold, which contained many cattle, was captured by Cæsar; and an attempt made to storm Cæsar's naval camp proving unsuccessful, Cassivellaunus sued for peace, gave hostages and promised an annual tribute. Consult Cæsar, 'Gallic War' (bk. V).

CASSOCK, a name formerly applied to a long loose gown worn over the other garments, in which sense the word is found in Shakespeare. It is now applied to a long, close-fitting garment worn by priests and clerics and in Catholic countries forming the ordinary dress of the priest. In the Roman Catholic Church, priests wear a black cassock; bishops and other prelates, purple; cardinals, red; and the Pope, white. In the Anglican Church, black is worn by all three orders of clergy, but bishops on state occasions often wear purple.

CASSOWARY, a corruption of the Malayan name for ratite birds of the family *Casuariidæ*, inhabitants of the Papuan Islands and Australasia, and forming, with their near allies the emus, the group *Megistanes*. They are large birds, the females standing five or six feet high (males are less in stature), and are clothed in hair-like feathers, which appear double, as the aftershaft is as large as the feather proper; these may reach a length of 12 inches or more on the rump, where they drape over the invisible tail. This coat is glossy black in both sexes and all species, whose distinguishing marks are found in the varying colors about the head. Like other ratite, or «wingless» birds, the wings are so reduced as to be hidden beneath the drooping plumage, except the ends of five stiff quills; these wings are quite useless for either flight, or aid in running, but are of some service as weapons. The legs are extremely stout, and are actuated by powerful muscles; and the three toes are armed with strong scratching-claws. The special feature of this family of birds, however, is the head, which is almost naked of feathers, and carries a crest, «helmet,» or «casque» of spongy bone which in some is flattened, and in others rises into a triangular or a pyramidal boss. The beak is stout, and keeled on top. The neck is naked, and in most cases adorned with one or more pendent wattles. These naked parts, and the head and helmet are brilliantly colored, differing in the various species of which 10 have been described. Thus the *Casuarius papuanus* of New Guinea is described as having «a dusky-black casque, blue head, throat and fore-neck, gray-green occiput and auricular region, and orange hind-neck, changing into rosy flesh-color toward the sides.» All the others are nearly as gaudy.

The cassowaries are forest-keeping birds, and have become very wary since their jungles were invaded by hunters. They are swift runners, hurling themselves forward with a peculiar striding gait, and bounding over obstacles. They are almost omnivorus, but feed mainly on berries, fallen fruit, bulbs and insects scratched out of the forest floor. They defend themselves vigorously when at bay, kicking powerfully in any direction, and striking with wings and beak. Yet they are tamable, and are kept like fowls by the natives of some districts. They are hunted in Australia for the sake of their skins from which are made mats, rugs, feathered ornaments, etc. The nest is a rough structure on the ground in a thicket. The three to six eggs are green, and incubation is done mainly if not exclusively by the cock-bird. Consult Salvatori, 'Ornitologia della Papuasia' (Turin 1882); Rothschild, 'Trans. Zool. Soc. of London' (1901); Evans, 'Birds' (New York 1900).

Ernest Ingersoll.

CAST, in the fine arts, is an impression taken by means of wax or plaster of Paris from a statue, bust, bas-relief or any other model, animate or inanimate. In taking a cast from a living person's face, it is necessary, first, to anoint the eyebrows and eyelashes, and any hairs about the cheeks and temples, with a little sweet-oil; then to insert two tubes (oiled also) of pasteboard into the nostrils, so that breathing may be performed through them; a handkerchief is then to be tied loosely over the face, and the head sloped backward in an elbow chair or sofa. Powdered and calcined plaster of Paris is then mixed with spring water to the consistence of cream, and poured in between the face and handerkerchief to the depth of half an inch. On becoming fixed or hard, it is removed and left to dry. When dried thoroughly it is well soaked with linseed oil, and an impression may then be taken from it, in plaster of Paris or soft clay; the hollow cast being first split longitudinally down the nose, so that the object cast may be more easily removed.

It ought to be observed that all models should be divided into several pieces or joints; thus, in that covering any round body, one side must be covered first with the plaster, and the sides pared with a knife, and smeared with clay and water, then the remaining part of the object covered with plaster, and a joint will thus be formed between the two parts; for, wherever the mixture of clay and water has been applied with a hair brush, the cast will not adhere, and therefore will be easily separated with the blunt edge of a knife. It is usual also to make small pits or depressions of the size of small buttons, on the edges of the joints of molds so that they may lock together well when added, and thus fit closely.

Plaster casts are varnished by a mixture of soap and white wax in boiling water. A quarter of an ounce of soap is dissolved in a pint of water, and an equal quantity of wax afterward incorporated. The cast is dipped in this liquid, and after drying a week is polished by rubbing with soft linen. The surface produced in this manner approaches to the polish of marble. When plaster casts are to be exposed to the weather, their durability is greatly increased by saturating them with linseed oil, with which wax or resin may be combined. When intended to resemble bronze, a soap is used made of linseed oil and soda, colored by the sulphates of copper and iron. Walls and ceilings are rendered waterproof in the same way.

CAST, or CASTING-LINE, a gut line used in angling, from two to four yards in length, having artificial flies attached to it at intervals of about two feet. For trout fishing the line is generally made of braided waterproof silk, and a leader of silkworm gut attached to the end of the line.

CAST IRON, Malleable. Malleable cast iron is a grade of metal which has a special composition, such that when annealed for a continued period of time it becomes malleable, can be bent and twisted. The castings, when taken from the sand of the foundry, are very hard and brittle. The fracture is dead white (the ordinary iron casting appearing gray to black when freshly broken).

The tensile strength of a good malleable casting should run between 42,000 and 48,000 pounds per square inch, though for ordinary purposes 35,000 pounds is quite good enough. Castings have been made running up to 63,000 pounds per square inch, but these would not be soft enough for general use, being better adapted for conveyor chains and castings which must not stretch. The elongation of a malleable casting runs between 2.5 to 7 per cent measured in two inches. The transverse strength measured by a 1 inch square bar, placed on supports 12 inches apart, and load applied at the centre, should be from 3,000 to 5,000 pounds for high quality material, and at least 2,500 for the ordinary product. The resilience of a malleable casting may be taken as eight times as high as a gray-iron one. Hence the great advantage of using malleable castings to resist shock. In fact where the shocks are light and often repeated, this casting will stand up better than a steel one.

The malleablization of cast iron has been known since the early part of the 18th century. The first record we have is by Réaumur in 1722. He states that a hard casting, by being embedded in ore and kept at a high temperature for a number of days, changed its structure and became soft and malleable. The process as then practised is still in vogue, and all attempts to hasten or otherwise modify it have not given continuously good results. The fundamental principle upon which the whole bined carbon in a white casting of a suitable process rests is the conversion of the com- composition to an amorphous form of carbon, which remains in the casting as a mechanical admixture. It is not crystalline like graphite, but in other respects behaves like it, and is determined chemically in the same manner.

To understand this, let us consider the two great divisions of cast iron — the Gray and the White. In the former we have nearly all the carbon present in a mechanical admixture, as graphite flakes situate between the crystals of the iron proper. But little carbon is present in the combined state, and if less than 0.20 per cent, the casting is dead soft. If the combined carbon is as high as 0.80 per cent, the rest of about 3 per cent being in the form of graphite, the casting will be a hard one. Now in the case of the white irons, the carbon is nearly all combined, and almost no graphite in mechanical admixture is present. Hence an exceedingly hard material is the result. It is the object of the malleablizing process to convert this chemically combined carbon in a white iron, or in a hard gray one for that matter, to an amorphous form, to which the name «temper carbon» has been given (from «Temperguss,» German for malleable casting). Any graphite present in the original casting is not changed, but with long-continued heat gives an opportunity for the entrance of oxygen, with ruinous results to the casting. Hence the short annealing of gray castings to benefit them, while the white casting can be annealed for six days, and then re-annealed again, without seriously hurting its strength.

There are two tendencies in the malleable casting industry, which result in different grades of metal. In Europe, from whence the process came, and where the irons used are not as pure, the annealing process is carried out longer than here, and hence much of the carbon present is removed from the casting by oxidizing it out. The result is a very ductile casting, but with a gray to white fracture (the fracture of a steel however, not of a hard white iron). The castings, moreover, are nearly all very light. In this country, with better irons, we have shortened the anneal to get just the conversion of the carbon, without attempting to burn it out by prolonged annealing, and hence we have a black heart in the casting. This is especially noticeable as we make very heavy work, comparatively speaking. Sections of one inch are common, and even heavier work is done, but with the use of chills in casting them, so that the carbon be surely all combined, and the casting dead white before the annealing is begun. Otherwise, if more than a slight mottling is present in the fracture, the casting is sure to come out «rotten» in strength (as it is called) when leaving the anneal. The temperature of the bath of molten metal has an important bearing on this, for with a very hot metal, heavy sections can be cast and still have their fracture white, while the same castings would be gray were the bath of melted metal colder.

Recent developments have brought about a division of the American «black-head» malleable process into the making of very low carbon, soft, but weak castings on the one hand, and medium carbon, strong, but stiff castings on the other. The former is for general use, and the latter for specification work of very high grade.

The contraction of a white casting, as made for malleable purposes is 3/16 inch to 5/16 inch per foot, but in annealing one-half of this is taken up by expansion, and hence the ordinary gray iron shrinkage is allowed for in making the patterns. For special work, however, it will pay to watch the action of the metal in the sand mold, and due allowances should be made in the pattern for abnormal contractions on the part of the casting, so that the dimensions of the annealed casting may come out all right.

As the metal when ready to pour may not always be of the desired temperature (in fact the temperature changes during tapping, going up steadily), it is best to pour the thin castings first, provided the iron be hot enough for this, then the medium weight castings, and finally the thick ones. By this time the metal will be very hot and the danger from excessive mottling avoided. Great care should be exercised to see that patterns are so proportioned that no shrinkage occurs in the interior of the metal. This is certain to take place at abrupt changes of section, at sharp angles and in heavy parts. Hence all sharp junctions on patterns should have fillets, and where great changes of section cannot be avoided, chills should be placed against the work. This will send the shrinkage into the interior of the casting where it will not matter so much.

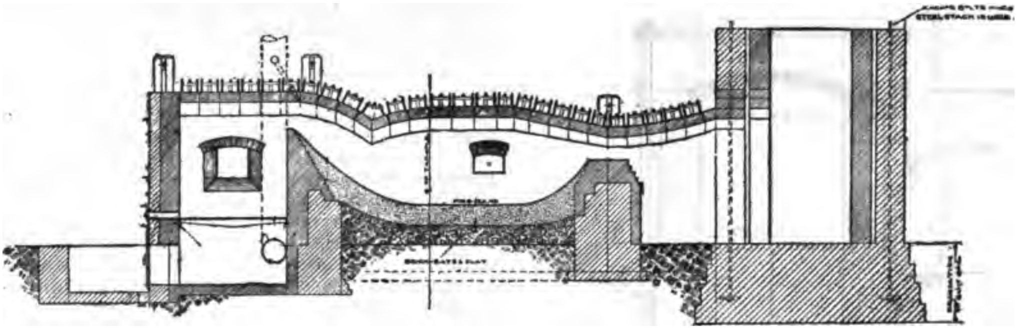
FIG. 1.— Longitudinal Section of Air Furnace for Malleable Castings

In general three things affect the state of a hard casting which will allow it to anneal properly or not. First the chemical composition of the metal itself. Second the thickness of the sections of the casting, and third the pouring temperature. The last two items have been gone over above. It remains to give specifications for the first. The most powerful agent affecting the state of the carbon present in a casting is the silicon. As it is necessary to have a casting white in fracture as it leaves the sand, the silicon must be very low. Then with the proper pouring temperature, and when poured into sections suitable for the composition employed, the results will be good. Naturally this will principally depend upon the thickness of the work made, as this cannot be changed, and then upon the heat of the iron, which can be regulated by careful melting. The thinner the castings, the higher the silicon the mixture can stand. Thus for pipe fittings, the silicon may run up to 1 per cent in the casting. For exceptionally heavy sectioned castings the silicon may have to run down as low as 0.45 per cent in order to get the best results. When charcoal irons were used exclusively (these standing more punishment in melting than the coke irons of the present day), the silicon oftentimes ran as low as 0.28 per cent in a casting and still this was first-rate. The general average, however, for all around medium and fairly heavy work is 0.65 per cent silicon in the casting, which means about 0.85 per cent to 0.90 per cent in the mixture; 0.45 per cent may be considered the lowest range for heavy work, and 1.25 per cent the highest for the lightest of castings.

The phosphorus should not exceed 0.225 per cent, the manganese not over 0.30, the sulphur as low as possible, preferably not over 0.05 in the casting, though in Europe, where the long anneal counteracts this evil, the sulphur goes very high, sometimes even up to 0.40 per cent.

The lower the total carbon, down to 2.75 below when trouble arises, the stronger will be the casting. (The total carbon may be run as low as 2.25, but only with the best of melting and annealing practice). Hence steel scrap is added to make the metal low in its carbon content. This is a much better plan than to refine the iron in the process to get the carbon low. In general it is best to simply melt a mixture, and then get it out of the furnace as quickly as possible, in order to get it away from oxidizing influences as quickly as may be. Five to 10 per cent of steel may be added, also malleable scrap, if necessary. In a 10-ton heat the best proportion of the mixture is five tons of pig iron, one ton malleable scrap, 500 pounds steel scrap and the balance the sprues of the previous work. The practical effect of these steel and other additions is about as follows: 100 pounds, wrought iron scrap equal 250 pounds steel, equal 2,000 pounds malleable scrap. Mixtures thus arranged come out about the same in strength, all other things being equal.

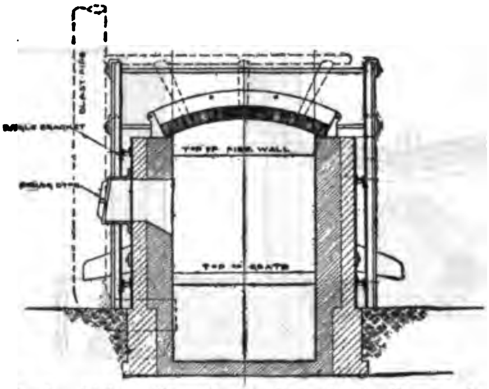

FIG. 2.—Section Through Fire-Box of Air Furnace for Malleable Castings

Charcoal iron is now being used only where the source of supply is close, and its cost is but a dollar or two over the best "Coke Malleable" or "Bessemer Malleable," as coke irons made specially for the malleable foundry are called (the last named being a Bessemer iron with the phosphorus a little higher than is allowed for steel). It is best to use these classes of "malleable" instead of the so-called "off" pig irons, for they are made with an extra amount of coke, and are much less oxidized than the irons blown under poor furnace conditions.

The mixtures used in the malleable foundry are as follows: Where the cupola is used for malleable castings in addition to making pots for annealing, the regular mixture as used for the air furnace or open hearth furnace must be reduced slightly in silicon, as the cupola burns out less of this element. Hence about 0.25 per cent is to be added to the amount of silicon required in the casting. In the case of the furnaces, about 0.30 per cent to 0.35 per cent must be added. For pots it is advisable to use good pig irons and to utilize salamanders and the large scrap pieces that are unsafe to put into the furnace. The silicon in the pots as cast should be about 0.60 per cent and hence about 0.85 per cent should go into the cupola.

The mixtures for air furnace and the open hearth furnace are about the same. Possibly the air furnace should have a little more silicon, as it is under the influence of the gases from combustion longer. There is also necessary an occasional use of ferrosilicon, especially in the open hearth, as through accident the metal may be badly burnt and the addition of ferrosilicon brings about the proper composition, though the metal should not be put into castings, but cast into pigs, to be fed subsequently into the regular mixtures in small quantities at a time. About 250 to 500 pounds ferrosilicon is usually all that is necessary for this purpose. The actual amount can be calculated at the time from the supposed loss of silicon in the bath.

Malleable castings are made in the cupola, the air furnace, the open hearth furnace, the electric furnace and in the crucible. The last named process is now only practised in Europe, being too expensive in this country, though turning out a most excellent product. The cupola process makes the poorest castings, as the metal is in contact with the fuel in this method. Hence the absorption of sulphur and oxidizing influences which are partly avoided in other processes. The peculiar constitution of the metal as cast makes it necessary to anneal it at a temperature some 200 degrees F. higher than ordinary air-furnace iron, which means a greater expense for wear and tear on the ovens and annealing pots. This class of castings is therefore only used for the cheaper grades of malleable casting, such as pipe fittings and hardware castings, where great strength is not essential, and enough ductility is had to satisfy the demands made on the work. The selling price is also about half a cent a pound less than the high grade metal.

The bulk of the malleable castings made in this country comes from the air furnace. This is an excellent melting process, can be manipulated easily, is not too expensive, and will probably continue to be the method used in most of our malleable works. The air furnace, as used for malleable purposes is somewhat different than that used for making rolls and gun castings. It is illustrated herewith.

The entire roof can be taken off in sections, called "bungs," so that the sand bottom can be made, and the charge put in. Where more than one heat is made without remaking the bottom, only a few bungs are lifted away after the first heat and the furnace is charged quickly, so as to keep it hot as long as possible. Firing is done at one end, and the charge when ready is tapped at one side, or both if two spouts are provided. It is very important to get a heat out quickly, as the metal is continuously oxidizing while in the furnace, after it has reached the proper composition. A 10-ton heat, when poured into small castings often takes three-quarters of an hour to tap, and hence the first iron and the very last may be two different things. Hence the dividing up of the work to get the class of metal best suited to the castings to be made. The amount of coal used to melt in a well-constructed air furnace is four pounds iron to one pound coal. In the case of the cupola, while ordinary gray iron practice requires one pound coal to every eight pounds iron, in malleable work, it takes one pound coke to only four pounds iron, or just the same as good air furnace practice. It is but just to say, however, that in many foundries of the country the air furnaces are so poorly constructed, kept in repair and operated that oftentimes one pound coal melts only two pounds iron.

Bottom is made placing layers of fire sand, that is, sand with about 98 per cent silica, and very free from fluxing impurities, on the brickwork and burning or partly fusing it together. The layers are about one inch thick, and are repeated until the proper shape is made. It takes from four to five hours to melt a 10-ton heat after this is charged, depending upon the quality of the bituminous coal used, and the condition of the furnace. From 6 to 10 heats can be made on the same bottom, with but little repairing, but the usual run is from two to four. In order to know when the heat is ready, a test plug, so called, is cast. This plug is about of a diameter equal to the heaviest section of the castings to be made. It is about eight inches long, and the mold for it is made by simply pushing the pattern into the sand in a box. The metal is taken from the bath by a small ladle dipped into it as deeply as possible. After pouring, as soon as the iron is set, the plug is grasped with a tongs, is dipped into water to cool it and then broken across. The fracture is observed, and if properly crystalline, and with but little or no mottling, the heat is ready to tap. If there is too much mottling, that is, too much graphite left, the process is continued to burn out more silicon, and also get the metal hotter, and another test plug taken. Experience will tell just how long a heat still has to run until ready to tap. After the iron has melted, the slag is skimmed off, and this gives a good chance for refining action, which means the burning out of silicon. The test plug is always taken after skimming, which is often done for the second time. When the heat is tapped, the men take it off in hand ladles, and pour the molds, throwing the iron into them as quickly as possible so that the necessarily small gates do not prevent the metal from filling the molds by chilling and resulting in "short pours."

The open hearth process (see STEEL — CRUCIBLE PROCESS) is by far the best one in general use, but is confined to those works where great quantities are made year in and year out. Thus there are several works where about 80 tons of castings are made daily, and in which the use of the open hearth is a paying proposition, especially as the same furnace can be used for making acid steel heats in place of malleable cast iron, as desired. The fuel consumption for the open hearth corresponds to one pound coal for six pounds iron melted; showing a considerable economy over all other methods. The use of a gas producer system, however, where natural gas is not available, makes the installation an elaborate one, and not desirable where the proper class of help is not available.

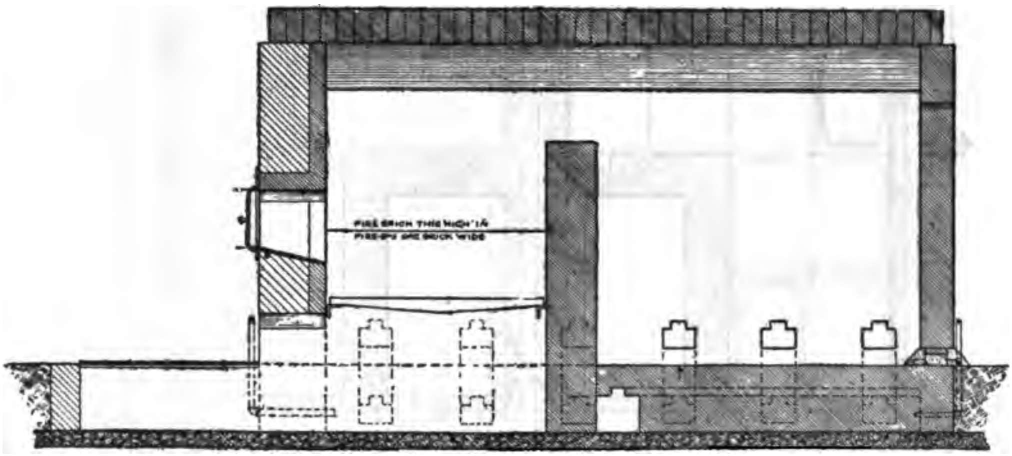

FIG. 3.— Longitudinal Section Through Fire-Box of Annealing Oven for Malleable Castings

In the case of the open hearth, the furnace is always hot, and hence a heat is finished about an hour sooner than in the air furnace. The iron gets hotter, and can be taken out in five-ton ladles to be distributed afterward and as the metal is not as long in contact with the gases as in the air furnace process, it is of better quality. The most economical size of furnace is the 20-ton, with the crane ladle to take off the metal in large quantities, so that tapping is not so long continued a matter as in the air furnace. The latest patented invention to assist in this is the application of two or more spouts to the furnace, so that metal may be taken out at different levels. In this way the surface of the bath, which is punished most by the gases, may be taken off first. Then while this is being poured off, the next part of the heat, now the top, is again taken off, and finally if three spouts are used, the bottom may be taken out as long as half an hour afterward without any deterioration or change in the metal.

From the foundry the castings, after shaking out the molds, go to the hard tumbling room, where they are freed from the adhering sand. This is done by means of tumbling barrels into which the castings, and a supply of "stars" made of the same hard iron, are placed. Where castings are liable to crack by this tumbling about, sticks of wood are introduced so that as they strike them, no damage is done. Where delicate castings are made, these are pickled in dilute sulphuric or in hydrofluoric acid.

After cleaning the hard castings, they are carefully sorted out, the cracked or otherwise defective pieces thrown out, to go back into the furnace again, and the good ones are sent into the annealing room. Where castings are made which crack as soon as they cool, on account of their shape, such as the hand wheels of freight cars for braking purposes, these while still red hot in the sand, are taken into small ovens where they are kept quite hot for a time, and are then allowed to cool very slowly with the oven. In this way they will not be cracked before going into the annealing ovens. The modern tendency is to introduce the sand blast for cleaning, as this removes every particle of sand from the hard castings. Where the iron has been allowed to get too low in silicon, or "high" as it is called, in contradistinction to "low" iron, where the silicon is too high, and the metal mottled or even gray, the sand is apt to burn on so hard that the tumbling all day does not remove it all. Here the sand blast is excellent.

From the sorting room the castings go to the annealing room, or rather to a part of it in which the packing is done. To anneal the hard castings they are placed into so-called "saggers" or annealing pots. These are simple, box-like shells, with no bottom, about one inch thick, and say 18 inches x 24 inches x 15 inches high. Three or four of these are placed over each other, and on a "stool" high enough to allow a free circulation of the gases under it. The castings are carefully placed in these pots and packed with "scale" in such a way that when red hot the whole may not settle and warp the work. This scale is puddle scale, hammer scale, or even iron ore. For that matter, as the process is more of a conversion of the combined carbon into the "temper carbon" the castings can be packed in fire clay or sand and good results obtained. But the puddle scale seems to give the best results, with greatest cheapness. The flakes that fall from the annealing pots. these lasting only for 7 to 14 heats, can be crushed

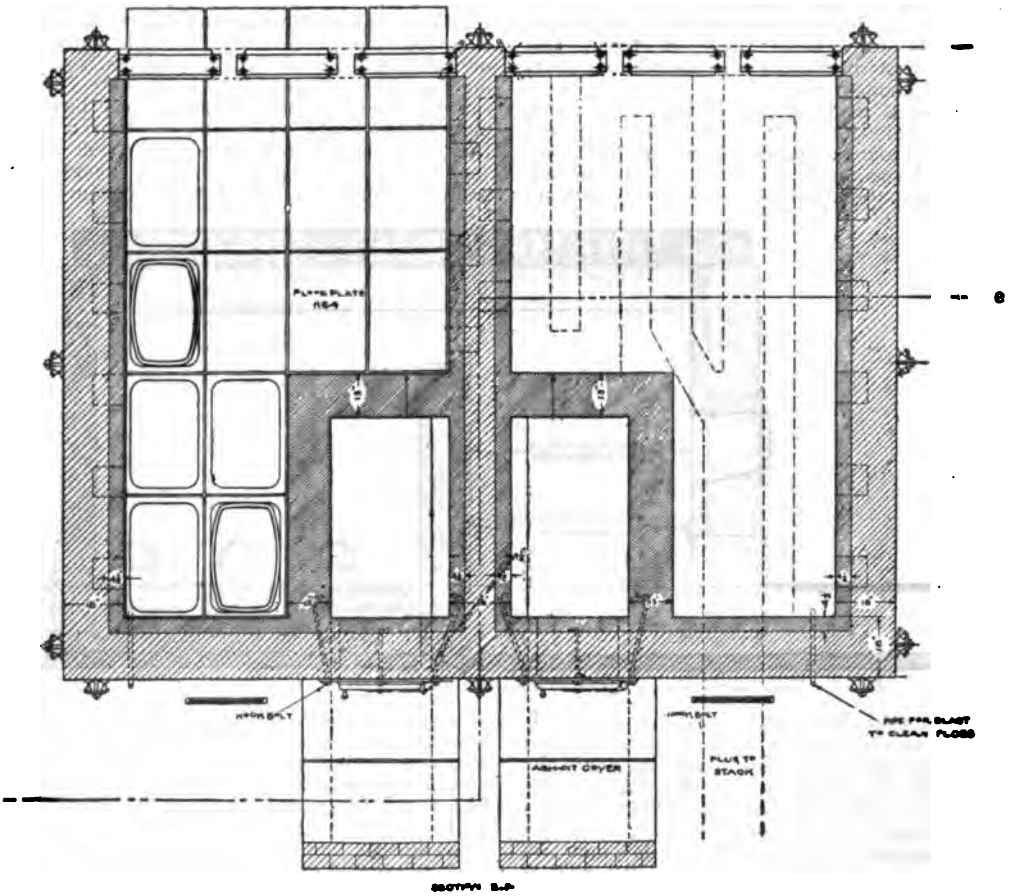

FIG. 4.— Plan of Annealing Oven for Malleable Castings

and make the finest kind of packing material, being pure oxide of iron, and no further scale than the initial lot need be purchased.

The pots, properly filled, are covered with a «mud» made of the sand rolled off the hard castings mixed with water. The joints of the pots are also carefully daubed up with this mud; the pots are introduced into the oven, either run in by a special carriage in the old style ovens, or lowered in from the crane in the new ovens, the tops of which can be removed. The ovens are now fired and within 36 to 48 hours the full temperature of 1,350 degrees F. in the coldest portion of the coldest pot is reached. This temperature is kept up preferably 60 hours, and the oven then allowed to cool slowly before the pots are withdrawn. The ovens are so constructed that they are heated inside and under the whole bottom, so that a difference of not more than 100 degrees F. throughout the portion filled with work may exist.

After the pots are taken out, they are dumped, the castings taken from the scale and the former sent to the soft tumbling room. Here they are packed with small pieces of annealed malleable castings, or with wood and leather, such as old shoes, etc., so that the adhering scale is removed, and a fine coat of graphite is given them. They come out shining black, and can be shipped direct, or else coated with asphalt, as required. Sometimes the castings must be straightened which should always be done cold, either by drop hammer or hydraulic press. Test plugs are usually cast on the important work, so that breaking these off on inspection the quality of the metal in the particular casting is revealed at a glance. Test bars for physical test should also be taken off with the first and last portion of every heat, so that all work from that heat can be traced and its quality known. The test bar has the further advantage of showing up the condition of the furnace, poor working on the part of which is immediately detected by a white rim on the casting.

The production of malleable castings in this country runs up to the enormous figure of 1,000,000 tons annually. In Europe about 75,000 tons are made in the same time. Most of the large companies now make steel castings in addition, as malleable cast iron, though most excellent for shock, is not strong enough to stand under the terrific strains that are now put on the structures where this work is used. Thus the 100,000-pound cars now require steel couplers, as the malleable ones tear apart, yet the latter will stand all the bumping that comes along while steel will not. The principal use for malleable castings is for railroad work. Next comes agricultural machinery. After that a great variety of work, such as pipe fittings, hardware, machine parts, chain links, tools, etc. The demand is constantly growing, and while steel was supposed to be replacing the malleable casting, this has not turned out to be the case.

Richard Moldenke,
Specialist on Metallurgy of Cast Iron and Expert in Malleable Castings.

CAST IRON PIPES. See Pipes.

CAST STEEL, blister steel which has been broken up, fused in a crucible, cast into ingots and rolled. The process of making cast steel was invented by Benjamin Huntsman, of Attercliff, near Sheffield, in 1770. See Steel — Open Hearth Manufacture; Steel — The Bessemer Process; Steel — Electrical Processes of Manufacture; Steel — Manufacture of Crucible; Steel — Special or Alloy Steels.

CASTAGNO, käs-tän'yō, **Andrea del,** Italian painter: b. Castagno, Tuscany, about the end of the 14th or beginning of the 15th century; d. Florence, 9 Aug. 1457. Being early deprived of his parents, who were extremely poor, he was employed by his uncle to tend cattle in the fields, and in that situation, by his surprising and untutored essays in the art, attracted the notice of Bernardetto de Medici, who placed him under the tuition of one of the best masters Florence then afforded. He was greatly influenced by the works of Donatello. At first he painted only in distemper and fresco. His drawing is bold but his color is crude. On the return of Cosimo de Medici he was commissioned to paint portraits of his opponents. These he portrayed hanging by their feet on the walls of the Palazzo de' Medici, which won him the nickname of «Andreino degli Impiccati.» He is the author of a series of 'Héros' and 'Sibylles' at Legnaia; where are also life-size figures of Dante, Petrarch, Boccaccio, Niccolo Ceccianote, founder of the Chartreuse at Florence; Farinata degli Uberti, liberator of his country; Pippo Spano, the conquerer of the Turks, and the fine equestrian statue of Niccolo da Tolentino. In the monastery Degli Angeli are several religious works, including a crucifixion. Another is at the Santa Maria Novello. Vasarie's story concerning the murder of Domenico Veneziano in order to procure his art of coloring in oils has been discredited, since it has been proved that Domenico survived him by several years and finished his paintings at the Santa Maria before Andrea was called there. Consult the monograph by Waldschmidt (Berlin 1900); Crowe and Cavalcaselle, 'History of Painting in Italy' (Vol. II); Muntz, E., 'Histoire de l'art pendant la Renaissance' (Vol. I, 1889).

CASTAIGNE, André, äṅ-drā kās-tān, French artist: b. Angoulême 1861. He studied at the Suisse Academy and at the École des Beaux Arts in Paris; he exhibited at the Paris Salon in 1884 and several times in later years. Among his pictures are 'Dante and Beatrice'; 'The Deluge'; 'Portrait of Vicomte de Dampierre'; and 'After the Combat' (in the Peabody Gallery at Baltimore). In 1890 he came to the United States and remained here until 1895. He was director of an art school in Baltimore and in 1891 began the illustrating work by which he is best known to the American public. His first work of this character was 'The Forty Niners' Ball' in the *Century Magazine* for May 1891; since then he has illustrated for several of the leading magazines; his designs include the pictures of the Texas cowboys in *Scribner's Magazine* and the World's Fair drawings and illustrations for 'Polly' in the *Century*. He illustrated B. I. Wheeler's 'Life of Alexander the Great' (1900). On his return to France he became instructor in the Colarossi Academy and opened a studio in Paris. He published 'Fata

Morgana,’ a novel dealing with the art life of Paris and illustrated by himself (1904). His work is characterized by spirited movement and dramatic feeling. Consult *The Critic* (Vol. XXIII, 57); *The Bookbuyer* (XII, 506).

CASTALIA, a celebrated fountain in Greece, the sacred spring of the Delphic oracle, at which all the pilgrims to Apollo's shrine were obliged to purify themselves. It issues from a fissure between two peaked cliffs, which form the summit of a semi-circular range of rocks, anciently called the Phædriades. These immediately adjoin Mount Parnassus, and rise to the height of 2,000 feet. The Castalian spring was said to impart poetic inspiration to those who drank of it, but it was only latterly by the Roman poets that it was invested with this attribute. It is now called the Fountain of Saint John, from a small chapel dedicated to Saint John which stands near its source.

CASTALIDES, kăs-tăl'ĭ-dēz, the Muses, so called from the fountain Castalia (q.v.), at the foot of Parnassus (q.v.).

CASTALIO, käs-täl-yō, **Sébastien, CASTELLIO** or **CASTELLION,** French theologian: b. Dauphiny 1515; d. Basel, 20 Dec. 1563. His original name was Châteillon. Through the influence of Calvin he was made professor of classical literature at Geneva. Having quarreled with the reformer, who caused his banishment in 1544, he repaired to Basel, where he taught the Greek language; but as his stipend did not suffice to support his numerous family, he was compelled to employ part of his time in agricultural labors. His writings include ‘De Hæreticis,’ a treatise opposing the punishment of heresy by civil authority, a Latin translation of the Bible, the best edition of which is in folio, Basel 1573, and a French translation of the Bible, dedicated to Henry II of France. Consult Buisson, ‘Life of Castalio’ Paris 1892). He defended the right of free discussion in a collection of maxims compiled from various sources.

CASTANEA, a trade name for the Brazil-nut and a genuine name for the chestnut (qq.v.).

CASTANETS, small wooden rattles, made in the shape of two bowls or cups, fitted together and tied by a string, and then fastened to the thumbs. The fingers being rapidly struck upon them, a tremulous sound is produced, which marks exactly the measure of the dance. Something similar to this was the *krotalon* of the ancients, who also made use of small cymbals in their dances and festivals in honor of Bacchus. It is probable, however, that they had their origin in the East, and were brought by the Moors into Spain. Here, too, they received their name *castañuelas,* from being commonly made of the wood of the chestnut (*castaño*), or from their color. They are still in use in Spain, and here and there in the south of France. The charm of variety has also procured for them a place in ballets and operas.

CASTANHEDA, käs-tän-yā'dä, **Fernao Lopez de,** Portuguese historian: b. Santarem about 1500; d. Coimbra, 23 March 1559. His father having been appointed to an important post in India, he was taken thither in youth, and was thus led to make the careful and unremitting researches embodied in the ‘Historia do descobrimento e conquista da India pelos Portugezes’ (1551–61), a work upon which Camoens drew largely in the course of his epic activity. It has been translated into French, Spanish, Italian and English.

CASTAÑOS, käs-tä'ñōs, **Don Francisco Xavier de,** Duke of Bailén, Spanish military officer: b. Madrid, 22 April 1756; d. Madrid, 24 Sept. 1852. Educated in military science in Germany, at the age of 16 he became captain of Grenadiers, of the Savoy Regiment, and distinguished himself in the reconquest of Minorca. On the invasion of the country by Napoleon, he received the command of a division of the Spanish army, and in July 1808 compelled 18,000 French, under General Dupont de l'Etang, to surrender at Bailén, but was in turn defeated by Lannes in November of the same year at Tudela. Under Wellington he served as general of the 4th Spanish *corps d'armée,* and took part in the battles of Albuera, Salamanca and Vittoria. In 1815 he was placed at the head of the Spanish army for the invasion of France, which was rendered unnecessary by the victory at Waterloo. In 1825 he was called to the State Council, where he became a decided opponent of the Carlist party. He was made Duke of Bailén in 1833 and in 1843 became guardian of the Queen Isabella.